ISSUES OF ECOLOGICAL CONCERN REGARDING THE PROPOSED LUEBBERS DEVELOPMENT

BACKGROUND INFORMATION

The proposed Luebbers development is located in the headwaters of Dixon Creek just outside the urban growth boundary (UGB) for the City of Corvallis. The development site contains two intermittent tributaries that flow directly into the West Fork of Dixon Creek. The proposed development would require substantial road improvement to Live Oak Drive according to BCC 515(2) of approximately 3,000 feet immediately adjacent to Dixon Creek including a section within the UGB (Figure 1). The development plan also proposes to construct Live Oak Court over steep slopes, which would connect Deer Run Street with Live Oak Drive. No plan for stormwater management as required by BCC 97.115 (1)(k) or drainage plan for the road design required by BCC 99.515 have been provided. Wetlands are located on the east side of Live Oak Drive near the proposed development and will require a detailed wetland delineation and possible mitigation plan. No endangered species survey has been performed and will likely be required. The southeasterly side of the proposed development site is very step and has a history of landslides. The site has been identified as "sensitive" by Benton County Planning Commission staff due to its steep slopes (most of the site contains >20% slope) and highly erodable soils and therefore subject to BCC 99.105. No detailed sewage disposal plan for the proposed housing development, required by BCC 99.705, was provided.

With this background information in mind, we offer the following comments about the ecological considerations and concerns this proposed developed invokes. We concentrate on the potential ecological impacts of the proposed development on three main areas -

(1) the riparian corridor of Dixon Creek directly impacted by the development,
(2) the ecological integrity of Dixon Creek overall, and
(3) wildlife habitat within and around the proposed development site.

DIXON CREEK

Since Dixon Creek would likely be the most impacted natural feature from the proposed housing development, it is important to provide contextual information about Dixon Creek. Dixon Creek originates in the hills of northwest Corvallis, and the watershed contains 2,712 acres. Three main tributaries (the East Fork, Middle Fork, and West Fork) flow southeast and converge just south of Walnut Boulevard at which point the mainstem of the creek flows through largely low-density residential and commercial properties of the city (approximately 1/3 of the watershed) before draining into the Willamette River near the sewage treatment facility (Figure 2). The proposed Luebbers development is located in the headwaters of the West Fork of Dixon Creek.

Historically, Dixon Creek behaved much like the Willamette River and many of its other tributary streams - channels naturally meandered across a wide floodplain resulting in a wide variety of habitats including numerous wetlands (Figure 3).

After most storm events, water drained from the surrounding uplands slowly compared to current flow conditions. Areas flooded, but they did so less severely over wider areas. Through extensive human engineering, the natural pattern and hydrologic dynamics of rivers and streams throughout the Willamette Valley was greatly transformed. Today, the river and many of its tributaries have been constrained into fewer, deeper channels. The loss of stream channels and natural hydrologic processes has had major ecological consequences not the least of which was a reduction of water quality, change in the hydrologic regime, and loss and alteration of critical habitat for numerous aquatic species including salmonids.

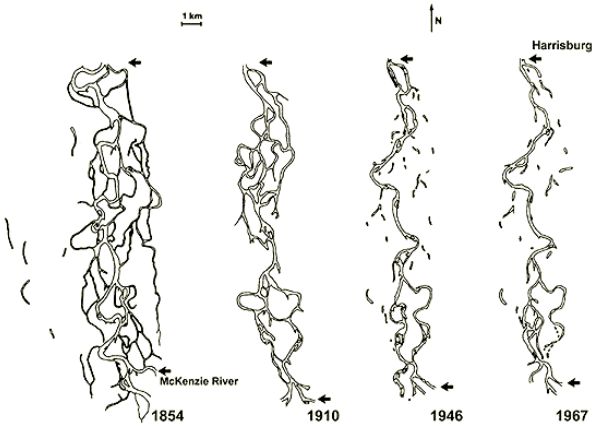

Figure 3. Channel loss in the Willamette River, Oregon. Source: Sedell and Froggatt 1984

BASELINE CONDITION OF DIXON CREEK

In 2002, Shapiro and Associates, Inc. conducted a baseline habitat evaluation that included Dixon Creek. A summary of their findings for Dixon Creek is presented below.

Sediment and Turbidity
High levels of fine sediment found in Dixon Creek are likely a function of the natural soils (silty-loam) and human development.
Chemical and Nutrient Contamination
In a study conducted in the mid-1990s, the U.S. Geological Survey found no excessive nutrient levels in Dixon Creek. However, the study did find numerous chemicals commonly used in lawn and landscape maintenance (e.g., Sevin, Diazinon, Tebuthiuron, and Casoron). Dixon Creek also exceeded standards for fecal coliform and *Escherichia coli* bacteria.
Physical Barriers
Numerous flat-bottomed culverts occur along Dixon Creek that may pose passage problems for some important aquatic species during periods of high and low flows. Limited survey results suggest that culverts are passable under at least some flow conditions.
Substrate
Exposed clay layers, silt, and riprap are the most common substrates in Dixon Creek. The large quantities of riprap are the result of bank stabilization efforts to support urban development.
Large Woody Debris (LWD)
Levels of LWD, which provide much needed stream structure, are poor throughout most of Dixon Creek; however, the highest concentrations of LWD occurs in the small headwater streams such as the area of the proposed Luebbers development.

Pool Frequency and Quality
Long, trench-like scour pools are the dominant aquatic habitat type in portions of Dixon Creek, but their frequency falls below salmon-supporting standard established by the National Marine Fisheries Service. Pools are important for fish survival.
Off-Channel Habitat
Channel entrenchment due to stream containment activities has resulted in a deeper Dixon Creek without much ecologically important off-channel habitat. Riparian corridors are narrow and contain many exotic species.
Streambank Condition
Streambank condition is variable in Dixon Creek. Bank erosion is most common in the upper reaches.
Peak and Base Flows
With a deeply incised channel along most of Dixon Creek, storm events result in unnaturally high, sharp spikes in the hydrograph.
Road Density
Road density in the urban portion of Dixon Creek is very high and a significant portion of the watershed is covered with impervious surface. Roads closely parallel the stream in many places and numerous road crossings fragment the aquatic and riparian habitat. At least 33 road crossings dissect Dixon Creek.
Disturbance History
More than 60% of the Dixon Creek watershed has been developed for commercial and residential land uses. Very little late successional forest remains.

Interpretation of Baseline Conditions

It is clear from the summary above that Dixon Creek is a severely altered tributary of the Willamette River. It carries relatively high levels of sediment, in part from the natural makeup of the soils, but also because of the high levels of human development throughout most of the watershed. It transports numerous chemical contaminants primarily from the use of lawn chemicals by homeowners and contains unacceptable levels of biological contamination in the form of fecal coliform bacteria, *E.coli*, and numerous exotic weed species. The natural meandering nature of Dixon Creek has been constrained to protect human structures, which has resulted in the loss of many ecological values. High levels of impervious surface, high road density in close proximity to Dixon Creek, and stream channeling have all led to a very different system than what was natural for Dixon Creek.

In spite of this fact, Dixon Creek still maintains important ecological values (some of which are discussed later) that should be acknowledged and fully considered before any further degradation to the watershed is approved. In fact, because of its degraded condition, further perturbations to what still exists should be measured with even greater care.

CONSERVATION VALUES OF DIXON CREEK CORVALLIS NATURAL FEATURES INVENTORY

The City of Corvallis is currently engaged in surveying natural features within the urban growth boundary (UGB). Two natural features surveyed were riparian areas and wetlands. The results are still preliminary, but have been through one scientific peer review process. Although the proposed housing development lies outside of the Corvallis UGB, a portion of the required surface improvements to Live Oak Drive would be contained within the UGB and immediately along side of the West Fork of Dixon Creek (see Figure 4).

Riparian Corridors

Riparian corridors (in open settings called gallery forests) include the area immediately adjacent to perennial or intermittent streams. Dominant vegetation can be trees, shrub, or herbaceous species, but under natural conditions riparian corridors are characterized by trees. In the Corvallis area, riparian corridors contain species such as Oregon ash (*Fraxinus latifolia*), big leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), white alder (*Alnus rhombifolia*), willows (*Salix spp.*), and Oregon white oak (*Quercus garryana*). The riparian corridor, which would be directly impacted by the required road improvement to Live Oak Drive is part of the riparian area labeled WC-DIX-R-21 in the Corvallis Natural Features Inventory.

Riparian corridors serve many important ecological functions. They are important for maintaining **water quality** by acting as sediment traps (therefore resisting erosion) and biological filters as the plants along streams intercept runoff from impervious surfaces and lawns and bind up many contaminants before they make their way into the water. With regard to erosion, the ability of riparian corridors to perform this important function is dependent upon slope, soil type, vegetation cover, landscape position, and degree of human disturbance. WC-DIX-R-21 scored a 12 out of a possible 14 (or High) for water quality.

Riparian corridors are important in **flood management** by slowing and temporarily holding water out of the main drainages thereby reducing flood impacts. Without high quality riparian corridors, storm runoff moves rapidly into streams and pulses through the system with sometimes great force with damaging consequences. WC-DIX-R-21 scored a 5 out of 8 (or Medium) due largely to the fact that there are no flood prone areas present. Along this portion of Dixon Creek, the stream is not constrained by human structures as is far more common as the creek flows into the more highly developed portions of Corvallis.

Riparian vegetation shades streams, which is critical in keeping water temperatures within the normal tolerances of many aquatic organisms. This **thermal regulation** function is most important in summer when direct solar radiation can elevate stream temperatures to lethal levels for many important aquatic organisms including salmonids. Data collected on July 19, 1995 by C. Andrus from the Benton County Soil and Water Conservation District showed lethal temperatures for cutthroat trout on that date along the portions of Dixon Creek where the riparian vegetation had been removed or altered allowing sunlight to warm the water. The area along

WC-DIX-R-21 showed water temperatures within normal limits favorable to fish. The data also showed that the high water temperatures were later reduced below the lethal level downstream due to riparian vegetation shading the watercourse. Removal of riparian vegetation to make required improvements to Live Oak Drive would likely result in negatively impacted water temperatures, and these impacts would persist for years.

Riparian corridors are widely recognized as extremely valuable **wildlife habitat** for both aquatic and terrestrial species. Riparian corridors provide food, cover, and water for many species. They also supply natural travel ways facilitating the movement of plant and animals for seasonal migration and dispersal. WC-DIX-R-21 scored a 19 out of a possible 23 (or High) for wildlife habitat value.

Wetlands

The wetland area immediately adjacent to the proposed development that falls within the UGB is labeled WC-DIX-W-6. It covers 1.34 acres and is classified as palustrine emergent with its hydrologic source coming from surface flow. The wetland has been described as having no educational or recreational value, but it does possess other qualities. With rankings ranging from 1 = best score to 3 = lowest score, WC-DIX-W-6 scored a 2 for wildlife habitat as well as for water quality, hydrologic control and sensitivity to future impacts. It scored a 1 (high) for enhancement potential and aesthetic quality. This site has been tentatively classified as a locally non-significant wetland.

Fish

In 1999, the **Chinook salmon** (*Oncorhynchus tshawytscha*) was listed as threatened under the Endangered Species Act by the National Marine Fisheries Service. Corvallis is part of the Upper Willamette River Watershed evolutionary significant unit (ESU). The City of Corvallis has been engaged in producing a response plan for the last few years and has listed the following major findings (see City of Corvallis ESA Salmon Listing Response Plan Project).

- Corvallis streams (including Dixon Creek) are not used by Chinook salmon for spawning and rearing.
- During high water, Mary's River and Dixon Creek provide important refugia for Chinook salmon.
- Main concern regarding Chinook salmon is maintaining water quality.
- Many city and citizen activities have a significant negative impact on water quality.

Chinook salmon

The most likely salmonid to be present in Dixon Creek is the **cutthroat trout** (*Oncorhynchus clarki clarki*). This species prefers relatively small streams with gravel bottoms and gentle gradients. Spawning adults migrate from the Pacific Ocean up the Willamette and into tributaries to spawn. Young fish remain in freshwater for years before returning to salt water. Some populations stay in freshwater for many years. According to Gary Galovich from the Oregon Department of Fish and Wildlife, cutthroat trout utilize Dixon Creek (including spawning) up to and including the headwaters.

Cutthroat trout

Pacific lamprey (*Lampetra tridentate*) is another species that is likely to be present in Dixon Creek. Like salmon, lampreys are also typically anadromous or living part of their life cycle in the ocean and returning to freshwater to spawn and rear young. Also like salmon, this typical life history has many exceptions (e.g., some populations become landlocked). Preferred spawning habitat for lamprey are gravel riffles, but larval forms (ammocoetes) live in silt, mud, and sandy backwater areas. An attempt to have the Pacific lamprey listed as threatened or endangered recently failed. Regardless, Pacific lamprey is an important component to natural Oregon streams and their numbers are dropping. Pacific lamprey is a potential conservation value of Dixon Creek.

Pacific lamprey

In recent surveys along portions of Dixon Creek, **longnose dace** (*Rhinichthys cataractae*) has been found. This common species is included in this review as an illustration that there are other resident fishes and other aquatic species of ecological value (e.g., crayfish, mollusks, and aquatic insects and worms) in Dixon Creek.

Longnose dace

Wildlife Connectivity

The importance of landscape connectivity is rapidly becoming a tenant in conservation biology both in aquatic and terrestrial environments. The more we learn about the composition, structure, and function of natural ecosystems, the more we come to understand the importance of physical connectedness. We have already discussed the background of Dixon Creek. We now would like to briefly discuss another important issue regarding the proposed Luebbers development. As can be seen from the Corvallis Natural Features Inventory, large concentrations of wildlife habitat within the UGB reside in the northern and western portions of town (Figure 5). The nearest wildlife habitat area to the proposed development is WC_1A, which is the northernmost section of a large expanse of open space in the northwestern corner of the UGB. The proposed development lies directly between this wildlife habitat unit in the south and the rural forestry lands to the north (Figure 2). Along with existing parcels on the west side

of Live Oak Drive, the Luebbers site makes up the most heavily forested connection between forest lands outside of the UGB in this region and the open space within the city limits. Wildlife species that now utilize this corridor, including blacktail deer, numerous small and medium-sized mammals, turkeys, owls, and numerous songbirds, could be effected (some significantly) by the proposed development.

RESTORATION POTENTIAL AND EDUCATION VALUES

The Benton County Soil and Water Conservation District has targeted Dixon Creek in their adopt-a-stream program. The program's goal is to improve water and habitat quality for selected streams through the participation of local citizens. Jefferson Elementary School and Corvallis High School, downstream from the proposed development, has been actively involved in litter cleanup, exotic plant removal, and riparian education. Stream habitat workshops have been provided to the public focusing on Dixon Creek.

Any development upstream from Jefferson Elementary and Corvallis High could negatively impact this restoration/education area along Dixon Creek.

ECOLOGICAL CONSIDERATIONS REGARDING THE PROPOSED LUEBBERS DEVELOPMENT

The potential for negative ecological impacts on Dixon Creek from the proposed development should be of major concern for the commissioners. The proposed development lies in the headwaters of Dixon Creek, a tributary of the Willamette River. A river begins at its headwaters making them a critical food source hydrologically and ecologically. Because of their intimate connection to the surrounding landscape, headwater streams deliver nutrients and organic material to downstream regions helping to sustain aquatic life and processes throughout the system. While headwaters are important for their downstream influences, they are also important in their own right as biologically distinctive and diverse ecosystems. Headwaters typically support rich and varied communities of plants and animals. In fact, the headwaters of Dixon Creek are the most ecologically intact reaches of an otherwise significantly degraded stream. Some of the more notable conservation values (e.g., cutthroat trout) threatened by this proposed development have been briefly discussed in this report, but the overall ecological integrity of the remaining natural system is of foremost importance.

The required road improvement to Live Oak Drive [BCC 515(2)] would have a major impact on an important stretch of riparian corridor along Dixon Creek described by the Corvallis Natural Features Inventory as "High" in water quality and wildlife habitat. Construction would likely require removal of substantial amounts of riparian vegetation with acute impacts to the creek itself with increased sedimentation and channel disruption. Over the long-term, the improved Live Oak Drive, the new Live Oak Court, and new housing would contribute significantly to the degradation of Dixon Creek, which has been selected by the Benton County Soil and Water Conservation District for restoration activities.

Both during construction and long after, there will be an increase in sedimentation to Dixon Creek. Improvements to Live Oak Drive, construction of Live Oak Court, driveways and housing surfaces will all lead to increased erosion. Erosion impacts can be mitigated to some degree through good engineering, but erosion will increase from its current state. Long-term erosion (including risk of landslides) will undoubtedly worsen if the development moves ahead. Page 5 - Finding of Fact #9 in the Benton County Community Development Department Staff Report on PC-03-02 states that the property contains slopes that are 20 - 30 percent, with the steepest areas reaching 40 percent. According to staff findings on page 7, erosion hazard is ranked high on slopes exceeding 20 percent, and the site is sensitive due to soils, drainage features, and topographic features present on the property. Nearly the entire proposed building site is over 20 percent slope.

Chemical contamination will also increase with inputs from oil and other pollutants washing off the increased impervious surface, more heavily traveled roadways and from the runoff of commonly used household lawn and garden chemicals. Dixon Creek already contains levels of dangerous pesticides, and adding to this existing problem at a location where levels of these chemicals are currently thought to be low is a concern.

Improper location and maintenance of sewage septic systems would translate into increases in fecal coliform bacteria and *E. coli* - both of which are already at unacceptable levels in Dixon Creek as reported by the U.S. Geological Survey. Poor water quality from biological agents such as these could pose a health risk to livestock and humans in the region. Currently, the Corvallis Natural Features Inventory ranks water quality in this portion of Dixon Creek High.

With the increase in impervious surface and disruption of a significant portion of Dixon Creek, peak flows will increase and streambed scouring will worsen (a condition already identified in other portions of Dixon Creek). Thermal regulation will be impaired by the removal of streamside vegetation during road construction and improvement. While data shows thermal recovery is possible once warmed water is again shaded by vegetation, high water temperatures have not been an issue for the headwaters of Dixon Creek. If the road enhancement leading to the proposed housing development goes forward, this will change. Also, the disruption of riparian vegetation will worsen an already bad situation with regard to invasive exotic weeds.

The proposed development also has the potential to disrupt the forest linkage zone between the northern region zoned as rural forestry and the wildlife habitat identified by the Corvallis Natural Features Assessment as inventory area WC-1A, which contains some important conservation values.