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December 13, 2011

Ms. Dianne Wassenich
Executive Director
San Marcos River Foundation, Inc.
Via email: wassenich@grandecom.net

Subject: Engineering Review of Water Quality and Drainage Issues Associated with the Proposed Casey Development

Dear Ms. Wassenich:

At your request I have reviewed the proposed Casey Development (North Campus Housing) at Sessom Drive and Loquat Street to determine potential water quality degradation, construction-phase sedimentation, downstream erosion, and flooding increases compared to development of the tract under existing ordinances. My review is based on the following documents:

- Backup material for the December 13, 2011 meeting of the San Marcos Planning and Zoning Commission;
- Site Improvement Aerial Photo, #11180; November 22, 2011 by BGO Architects;
- Existing Condition Aerial Photo, #11180; November 22, 2011 by BGO Architects;
- Existing Drainage Area Map, sealed by Stephen Ramsey on November 15, 2011;
- Proposed Drainage Area Map, sealed by Stephen Ramsey on November 15, 2011;
- North Campus Existing Conditions and Topographic Plan by Stephen Ramsey, no date; and
- Texas State University North Campus Housing; Darren Casey Interests, Inc., Planned Development District Standards, revised November 18, 2011, (not approved).

The project documents I reviewed contain inconsistencies and are likely not completely accurate, as the developers and city staff continue to negotiate the proposed approval. The comments below are derived, however, from fundamental characteristics of the proposed development. Without significant modification to the proposed scope and scale, they will be generally accurate.

Background

The proposed development would occur on 14.328 acres of land currently regulated as platted lots, unplatted property, and unconstructed road rights-of-way. The project contemplates abandonment of the road rights-of-way. Existing low-density residential housing would be replaced with a 419-unit development with ground floor retail, multiple stories of apartments, and structured parking. The property is currently zoned SF-6.

The proposed development would be located in the Edwards Aquifer transition zone, an area recognized by the City of San Marcos and the State of Texas as developmentally sensitive because of the likelihood that activities on and within this area will affect the quality and quantity of water in the Edwards Aquifer that feeds San Marcos Springs.

The Sessom Creek catchment area upstream of the project is about 59 acres. That catchment area size places the proposed development within the sensitive headwaters area of Sessom Creek. Creek headwaters areas are uniquely important to sustaining baseflow and the ecological function of downstream reaches.

Impervious Cover

San Marcos Land Development Code Table 4.1.6.1 established the impervious cover limit for SF-6 zoning at 50% imperviousness. The proposed Planned Development District would increase allowable impervious cover from 50% to a maximum of 60%.[1] As illustrated in the following sections, this increase in allowable impervious area will increase storm runoff and pollution loads from the developed site. These changes will increase erosion and water quality degradation in the Sessom Creek, tributary to the San Marcos River, despite the proposed flood detention and enhanced storm runoff treatment controls.

Language in the proposed agreement would appear to exempt roof-top gardens or any areas with planter boxes from impervious cover calculations, even though these areas may be disconnected by impervious barriers from the natural hydrologic system:

[1] North Campus Housing PPD, page 4.

> *"For the purpose of this PDD, landscape areas shall be considered those pervious areas contained within the site containing living plant material including, but not limited to, trees, shrubs, flowers, grass or other living ground cover or native vegetation."*[2]

This allowance may further degrade water quality beyond that represented in the calculations of this report.

Water Pollution Increases

The City of San Marcos Land Development Code §5.2.4.1 requires development with more than 15 percent impervious cover to implement best management practices to limit total suspended solids increases from development to no more than 20% above that which would occur from natural drainage from the site. The proposed Planned Development District agreement states that the project will achieve a minimum of 85% total suspended solids removal.

Figure 1 illustrates differences in average annual total suspended solids from the site as it is currently constructed, from a code-compliant development, and from the proposed Planned Development District project. The increase in total suspended solids above that of the current development is 758 pounds per year, which is 80% of the current average annual loads.

Runoff treatment to remove total suspended solids does not, however, ensure removal of other pollutants present in storm water including nutrients, toxic metals, and organic chemicals like gasoline and motor oil components. These chemicals are commonly found in storm runoff from parking areas and garages. They are more degrading of the quality of the stream than suspended sediment alone.

The proposed Planned Development District would allow increases in nitrogen, lead, and chemical oxygen demand pollution compared to discharges from development under the current zoneing, as shown in Figures 2 through 4.

[2] Page 7.

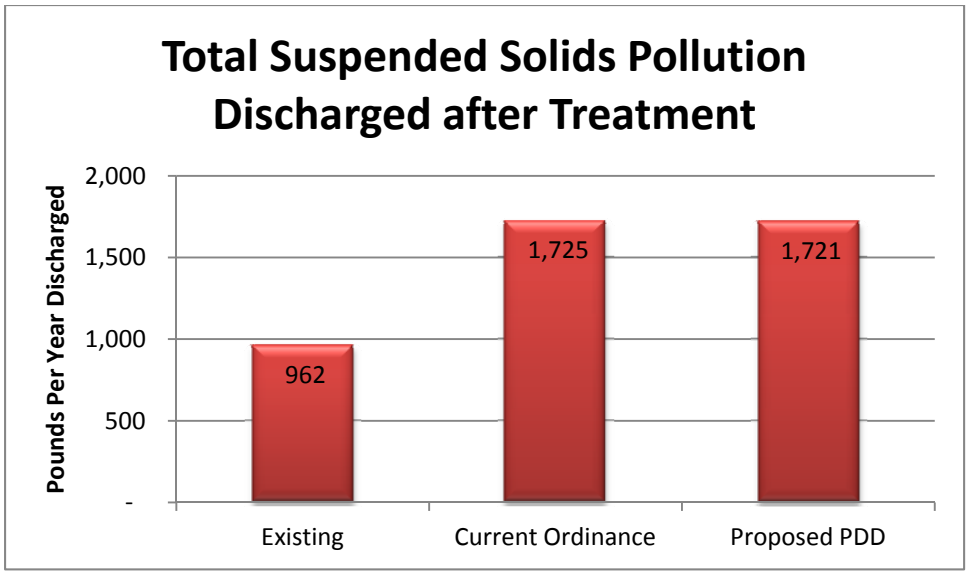

Figure 1. Total Suspended Solids Pollution Increases from the Proposed Casey Development

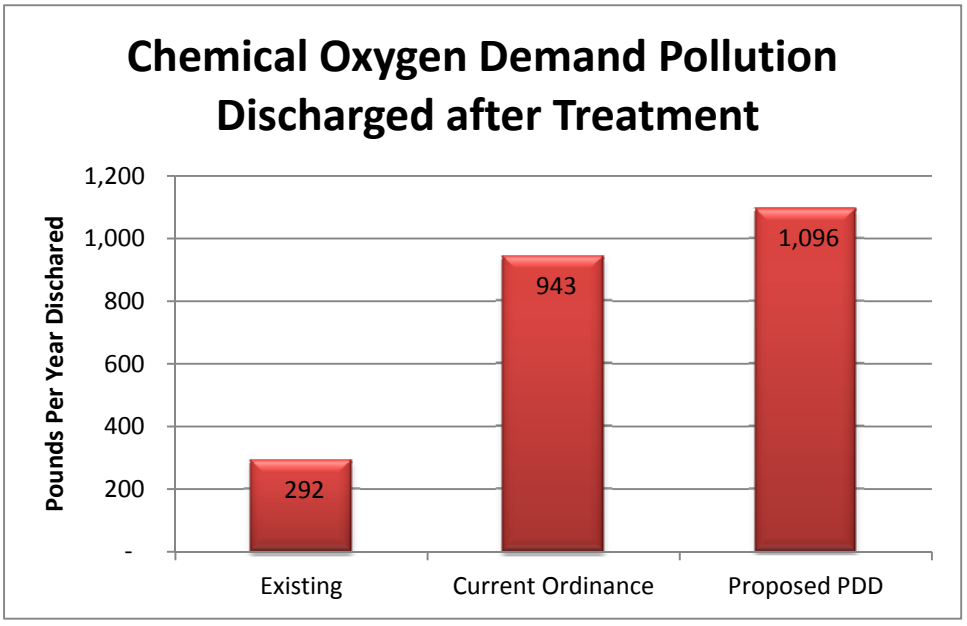

Figure 2. Chemical Oxygen Demand Pollution Increases from the Proposed Casey Development

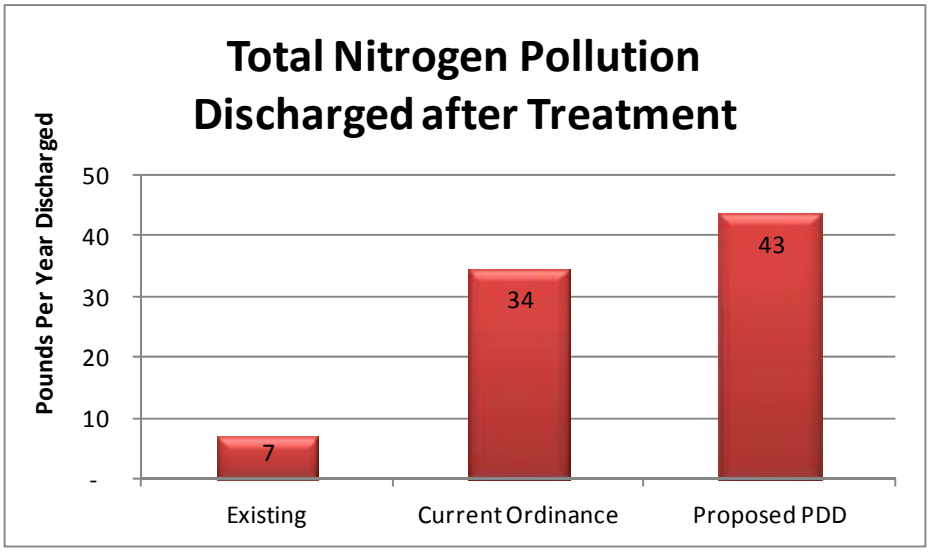

Figure 3. Total Nitrogen Pollution Increases from the Proposed Casey Development

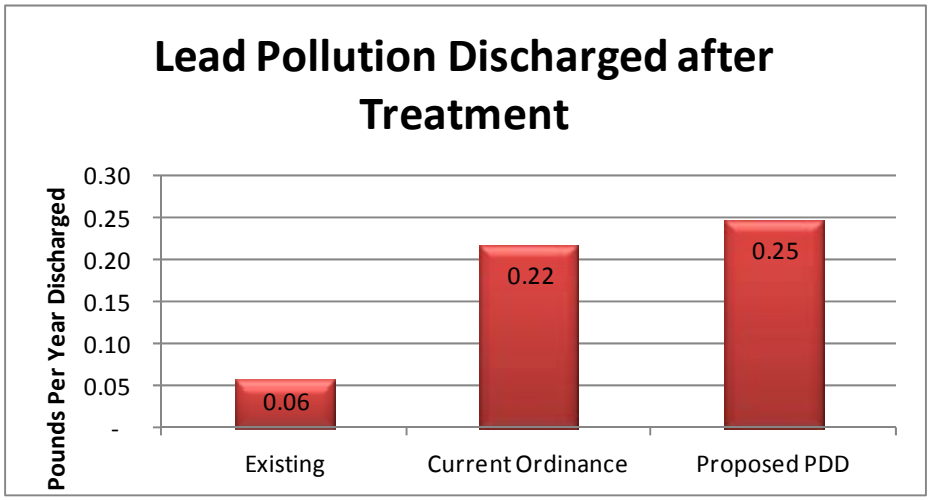

Figure 4. Lead Pollution Increases from the Proposed Casey Development

The applicant also proposes to use bioretention storm treatment[3] which commonly increases nutrient concentrations compared to natural runoff.[4] The applicant proposes to eliminate parking lot roof runoff from the impervious cover calculations.[5] Monitoring in Texas, however, indicates that roof runoff may contain chemicals at concentrations that exceed water quality standards; and

[3] Steve Ramsey, personal conversation, December 9, 2011.
[4] TCEQ, page 3-16, http://www.tceq.texas.gov/publications/rg/rg-348/chapter3.html/at_download/file, December 12, 2011.
[5] Steve Ramsey, personal conversation, December 9, 2011.

the TCEQ requires that they be included in Best Management Practice designs.[6] These applicant proposals would increase the magnitude of pollution discharge beyond those predicted in these graphs.

Storm Runoff Volume

In addition to increasing pollution, the additional impervious area that would be allowed by the proposed development will increase the total volume of storm runoff from the site. As shown on Figure 5, the average annual volume of storm runoff would increase by a factor of slightly more than three compared to the current conditions.

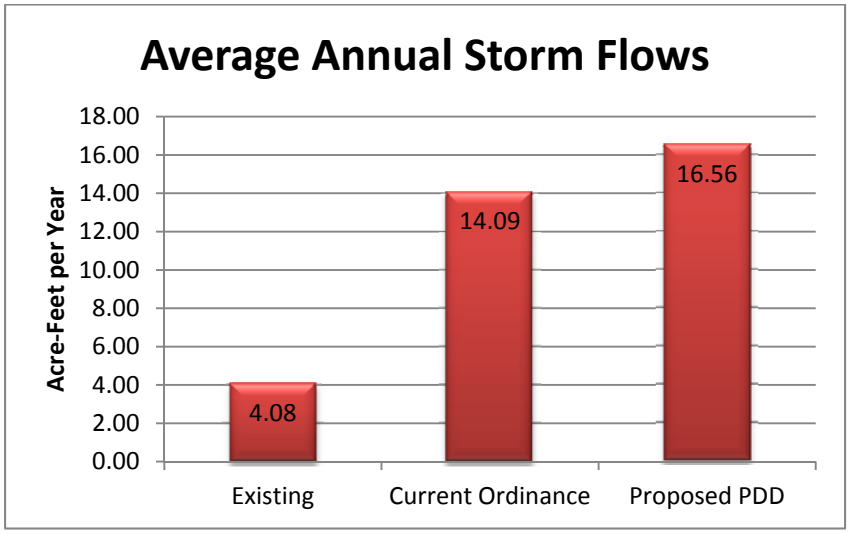

Figure 5. Storm Runoff Volume Increases from the proposed Casey Development

The consequences of this increase in storm runoff volume would be only partly mitigated by flood detention to limit peak storm flows to pre-developed rates. Even with no increase in the peak flow rate, the duration of the peak flow must be extended to discharge the extra runoff volume. The consequences of the extended peak flow duration will be longer flood periods and higher flood elevations when the extended peak flow overlaps with peak flow rates from downstream contributing areas.

[6] TCEQ, page 3-28.

Downstream channels will also adjust to the increased volume of storm flow by deepening the channel bottom to bedrock, and widening the channel cross-section. Bank erosion and the loss of trees, fences, outbuildings, and sometimes structures will occur during the channel adjustment period. A rock-bottomed channel cross-section conveying flows from an area developed with 60% imperviousness will be almost five times larger than the cross-section of a channel conveying flows from an area with 10% imperviousness.[7] See Figure 6. The contribution of bank and channel bed erosion from this channel cross section readjustment to stream sediment loads will overshadow any total suspended solids reduction from the proposed Best Management Practices to reduce total suspended solids in the site discharge.

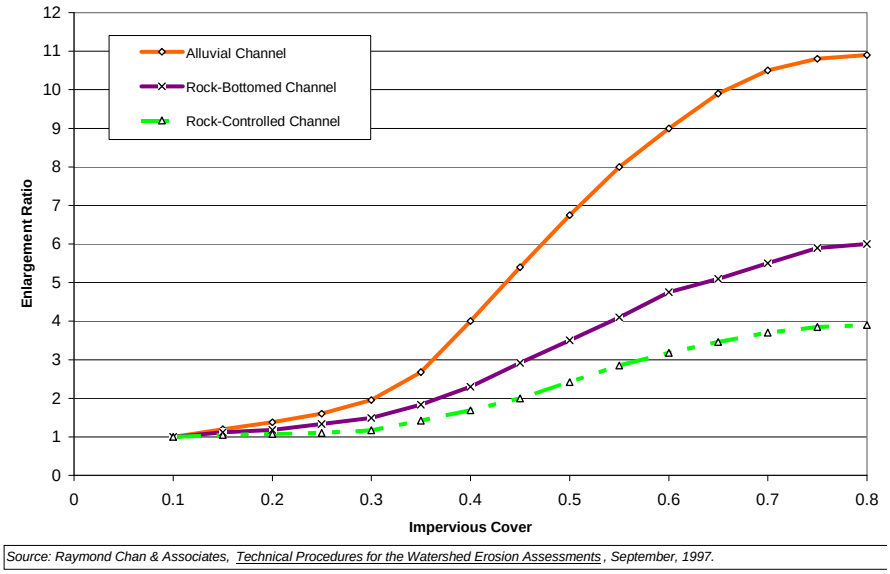

Figure 6. Channel Enlargement with Increasing Impervious Area

Low Impact Development

The application states that Low Impact Development practices will be implemented. Key elements of Low Impact Development include:

[7] Raymond Chan and Associates, *Technical Procedures for the Watershed Erosion Assessment,* September 2007. Note that these relationships were derived for Texas Hill Country watersheds with underlying geology and soils similar to those present at the proposed development site.

- Maintaining natural drainage ways and patterns;
- Directing runoff to depression areas;
- Preserving as many trees as possible;
- Reducing the percentage of impervious area;
- Locating BMPs in soils with higher permeability;
- Disconnecting impervious areas
- Limiting clearing and grading in areas with permeable soils
- Placing impervious cover on less permeable soils;
- Facilitating on-lot storage and infiltration;
- Revegetating cleared and graded areas; and
- Dispersing storm runoff rather than concentrating it in swales, pipes, or channels.[8]

The proposed 60% imperviousness of the proposed project violates a key element of Low Impact Design: to reduce impervious area percentages. This impervious area concentration will limit design opportunities to reproduce naturally-occurring patterns of storm runoff and soil recharge. Without the use of pumps, which have been generally unreliable to convey storm runoff, natural site topography eliminates the opportunity to convey excess storm runoff from the proposed development to the proposed park area where it could be dispersed and infiltrate.

As discussed above, the consequences of the increased storm runoff volume will be to increase downstream erosion and eliminate site contributions to clear and habitat-sustaining stream baseflow. Depending on the timing of storm releases and whether flood detention is provided for the 100-year storm, flood elevations in Sesson Creek will also likely be higher.

Construction-Phase Erosion

Construction-phase erosion contributes a significant fraction of all of the sediment that will ever discharge from a site. Estimated sediment loads from construction sites can range from 35 to 45 tons per acre per year. Sediment loads are higher from areas with more than 15% slopes, as occur

[8] Department of Environmental Resources, Prince George's County, Maryland, *Low-Impact Development Design Manual*, November 1997.

on the proposed development site. Despite numerous regulations to prevent construction-phase erosion and sedimentation, the realities of construction-site activities often lead to improperly designed, installed, and maintained controls. The vagaries of weather extremes mean that even properly designed, installed, and maintained systems fail during severe storm events.

The proposed Planned Development District entitlement document states:

> *" . . .no construction shall begin until all required City Plans are approved and a SWPPP is prepared. . . .All erosion and sedimentation controls shall be monitored and maintained at all times during the construction process."*

The Texas Pollution Discharge Elimination System Storm Water Pollution Prevention Plan (TPDES SWPPP) is a weak process to prevent construction-phase erosion and downstream sediment pollution. There is no requirement to submit the SWPPP to any agency for design review. There is no requirement for agency inspection of SWPPP controls. Inspections under the TPDES SWPPP process generally occur only ***after*** the state receives notice of a sediment discharge process. After construction-phase erosion has occurred and migrated offsite, sediment removal from downstream areas is expensive and may not occur absent a legal process to compel cleanup, as evidenced by the contamination of Hamilton Pool in Travis County from construction sediment.

Furthermore, no construction process allows for continuous monitoring and maintenance of erosion and sedimentation controls. The reality is that these systems, even on a carefully managed site, may be monitored no more frequently than once a week. When these systems fail during a storm event, it is often impossible to repair them until after the rain ends and soils dry enough to allow equipment access.

In summary, the proposed Planned Development District would significantly contribute to increased storm flows, stream bank erosion, and pollution from the site into Sessom Creek. The effect of these changes would not be fully mitigated by terms in the proposed Planned Development District entitlement agreement. Because of the size of the development, its high impervious cover, and its location in a sensitive headwaters area, and its location on and adjacent

to steeply-sloping land, the potential likelihood of erosion, flooding and water quality degradation is correspondingly high. Neither State of Texas nor City of San Marcos regulations, nor the proposed development agreement require mitigation of these consequences.

Sincerely,

D. Lauren Ross, Ph. D., P. E.
President
Glenrose Engineering, Inc.

13 December 2011