Linda S. Adams
Agency Secretary

California Regional Water Quality Control Board
Central Coast Region

Arnold Schwarzenegger
Governor

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April 3, 2009

Ms. Robin Fried
Environmental Health & Safety Office
University of California, Santa Cruz
1156 High Street
Santa Cruz, CA 95064

Dear Ms. Fried:

NOTICE OF ENROLLMENT – NPDES SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS GENERAL PERMIT; UNIVERSITY OF CALIFORNIA SANTA CRUZ, SANTA CRUZ COUNTY, WDID # 3 44MS05079

The Central Coast Regional Water Quality Control Board (Water Board) received a Notice of Intent, Storm Water Management Plan (SWMP), map, and fee for the University of California Santa Cruz's (University's) Municipal Separate Storm Sewer System (MS4). These items are required to enroll in the National Pollutant Discharge Elimination System General Permit for the Discharge of Storm Water from Small Municipal Separate Storm Sewer Systems, Order No. 2003-0005-DWQ (General Permit).

Water Board staff reviewed the University's SWMP and found it, combined with a number of specific revisions described in Attachment 1, to be in compliance with the General Permit and to meet the maximum extent practicable (MEP) standard set forth in the General Permit. The University's SWMP was available to the public for a 60-day comment period, and we received comments from stakeholders. Water Board staff responded to all comments received. These comments and responses are contained in Attachment 2. The comment letters are contained in Attachment 3.

The public did not request a hearing for the Water Board to consider approval of the SWMP and enrollment of the University under the General Permit. We also understand that the University, upon receipt of this amended Notice of Enrollment, will withdraw its request for a hearing. The General Permit states that if no hearing is necessary, the Water Board Executive Officer will notify the regulated MS4 that it has obtained permit coverage only after Water Board staff has reviewed the SWMP and has determined that the SWMP meets the MEP standard established in the General Permit.

I am hereby approving the University's SWMP with the following condition:
Pursuant to Water Code Section 13383, the University of California Santa Cruz is required to amend the SWMP no later than **June 3, 2009**, to include all the changes shown in the "Final Table of Required Changes," Attachment 1 to this letter. Per Water Code Section 13385, failure to make these revisions may subject the University of California Santa Cruz

to Administrative Civil Liability for up to $10,000 for each day of violation. The University must provide a copy of the revised pages of the SWMP to the Water Board no later than **June 3, 2009**.

As of April 3, 2009, discharges from the University's MS4 are authorized by the General Permit. The University is required to implement the SWMP and comply with the General Permit. The University's first annual reporting period ends June 30, 2010. The University's first annual report is due to the Water Board on September 15, 2010, and shall cover the period from April 3, 2009 through June 30, 2010.

Thank you for your cooperation and efforts to enroll the University under the General Permit. If you have questions regarding this matter, please contact **Phil Hammer at (805) 549-3882, or phammer@waterboards.ca.gov** or Matt Thompson at (805) 549-3159 or mthompson@waterboards.ca.gov .

Sincerely,

Roger W. Briggs
Executive Officer

cc: (by electronic mail)
Robert Curry, curry@ucsc.edu
Don Stevens, Habitat and Watershed Caretakers, don@bind.com
Grey Hayes, coastalprarie@aol.com
Kim Busby, California Polytechnic State University, kbusby@calpoly.edu

Attachment 1: Final Table of Required Revisions
Attachment 2: Response to Comments
Attachment 3: Comment Letters Received during 60-day Public Comment Period

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ATTACHMENT 1

TABLE of REQUIRED REVISIONS
University of California, Santa Cruz Storm Water Management Program

Acronyms/Abbreviations:
BMP - Best Management Practice
LID - Low Impact Development
SWMP - Storm Water Management Plan
University - University of California, Santa Cruz
Water Board - Central Coast Regional Water Quality Control Board

Item Number	SWMP Section	Subject	Issue	Required Revisions
1	BMP # 1	Effectiveness Assessment	The SWMP states that the University will use a survey to determine target audiences' awareness of the educational brochures, but the SWMP does not indicate that the University will use a survey to determine target audiences' awareness of the content of the educational brochures. The goal of the educational brochures should be for targeted audiences to become aware of the brochures' content. The effectiveness assessment should reflect this goal by ensuring that awareness of the brochures' content will be assessed during the survey.	Modify the effectiveness assessment of BMP # 1 to ensure that awareness of the educational brochures' content will be assessed during the survey.
2	Public Education and Outreach BMPs	Community-Based Social Marketing	The University's cover letter for the revised SWMP states the University will "reconsider the potential effectiveness of a community-based social marketing	Include a BMP in the SWMP to consider use of community-based social marketing in the future if additional approaches are needed to prompt desired behaviors.

Item Number	SWMP Section	Subject	Issue	Required Revisions
			program in the future if additional approaches are needed to prompt desired behaviors." This commitment should be included in the SWMP as a specific BMP.	
3	Public Participation	University Neighbors	The University's cover letter for the revised SWMP identifies several activities the University conducts to foster participation from University neighbors. The SWMP should include a BMP committing to ongoing implementation of these activities to foster University neighbors' participation. The BMP should detail how the activities relate directly to SWMP development and implementation.	Include a BMP committing to ongoing implementation of current activities to foster University neighbors' participation. Describe how the activities relate directly to SWMP development and implementation.
4	BMP # 41	Outfall Screening	The University removed language from the SWMP that previously committed the University to monitoring all outfalls at least once annually. Removal of this language results in uncertainty regarding the scope of this program at the Main Campus. The SWMP states that main outfalls will be screened; however, it is unclear what constitutes a "main" outfall and how many main outfalls are present at the Main Campus.	Modify BMP # 41 to identify the percentage of outfalls that will be screened in permit years 4 and 5 at the Main Campus.
5	BMP # 55.5	Interim Hydromodification	The interim hydromodification control standards provided are not quantifiable	Replace the BMP with the following or equivalent: Within one year of enrollment

Item Number	SWMP Section	Subject	Issue	Required Revisions
		Criteria	or supported by technical findings. For example, the range of flows for which pre- and post-project flow rates and durations must match is not identified. Any proposed control standards, including numeric criteria for flow volume, rate, and duration control, will require review by Water Board staff based on technical findings to determine the standards' adequacy. The University has 12 months from the date of their enrollment under the General Permit to develop and adopt quantifiable interim hydromodification control standards with Water Board approval. Inclusion of the draft standards in the SWMP is not appropriate at this time.	under the General Permit, the City will have adequate development review and permitting procedures to impose conditions of approval, or other enforceable mechanisms, to implement quantifiable measures (numeric criteria) for hydromodification control.
6	BMP # 55.5	Interim Hydromodification Criteria	The SWMP does not include a schedule and approach to develop quantifiable interim hydromodification criteria.	Modify the SWMP to include the development of interim hydromodification criteria using one of the options listed below: Option 1: The proposed criteria may include the following types of requirements which provide a high degree of assurance of effective hydromodification control without regard to the nuances of individual

Item Number	SWMP Section	Subject	Issue	Required Revisions
				watersheds: • For new and re-development projects, Effective Impervious Area[1] shall be maintained at less than five percent (5%) of total project area. • For new and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, the post-construction runoff hydrographs shall match within one percent (1%) the pre-construction[2] runoff hydrographs, for a range of events with return periods from 1-year to 10-years. • For projects whose disturbed project area exceeds two acres, preserve the pre-construction drainage density (miles of stream length per square mile of watershed) for all drainage areas serving a first order stream[3] or larger, and ensure that post-project time of concentration is equal or greater than pre-project time of concentration. OR

[1] Effective Impervious Area is that portion of the impervious area that drains directly to a receiving surface waterbody via a hardened storm drain conveyance without first draining to a pervious area. In other words, impervious surfaces tributary to pervious areas are not considered Effective Impervious Area.

[2] Pre-construction condition is defined as undeveloped soil type and vegetation.

[3] A first order stream is defined as a stream with no tributaries.

Item Number	SWMP Section	Subject	Issue	Required Revisions
				Option 2: The University may use the following process to develop interim criteria as effective as the above criteria. "As effective as" means the University may use other approaches (including other variables or numeric criteria, different than Option 1 criteria, appropriate for the University's watersheds) to control hydromodification and protect the biological and physical integrity of the University's watersheds. Other acceptable approaches to develop interim criteria that are as effective as Option 1 include: A. Adopt and implement hydromodification criteria developed by another local municipality and approved by Board staff, such as the criteria the Water Board adopted for the City of Salinas, as interim criteria; OR use the following methodology to develop interim criteria: B. Include a BMP to develop interim hydromodification criteria, including a period of no less than three (3) weeks to allow for Water Board staff's review of the proposed criteria. The BMP shall state: The University shall develop interim flow control and infiltration criteria. These interim

Item Number	SWMP Section	Subject	Issue	Required Revisions
				criteria shall be developed within one year of the University's enrollment. For the interim criteria, the University shall: • Identify a range of runoff flow rates for which post-project runoff flow rates and durations shall not exceed pre-development runoff rates and durations, where the increased discharge rates and durations will result in off-site erosion or other significant adverse impacts to beneficial uses. Pre-development refers to the soil type, vegetation and amount of impervious surface existing on the site prior to the development project. • Establish numeric criteria for development projects to maximize infiltration on-site and approximate natural infiltration levels to the maximum extent practicable and to effectively implement applicable low-impact development strategies. • Identify the projects, including project type, size and location, to which the University will apply the interim criteria. The projects to which the University will apply the interim criteria will include all those projects that will cause off-site erosion or other significant adverse impacts to beneficial uses.

Item Number	SWMP Section	Subject	Issue	Required Revisions
				• Identify methods to be used by project proponents to demonstrate compliance with the interim discharge rate and duration criteria, potentially including continuous simulation of the entire rainfall record. • Identify methods to be used by project proponents to demonstrate compliance with the interim infiltration criteria, including analysis of site imperviousness.
7	BMP # 55.6	Hydromodification Management Plan	While the SWMP discusses development of long-term hydromodification requirements, it does not describe the process to be followed to develop the requirements as part of a Hydromodification Management Plan.	Modify BMP # 55.6 to describe how and when the University will develop long-term hydromodification criteria and control measures as part of a Hydromodification Management Plan that will be based on a technical assessment of the impacts of development on the University watersheds. An adequate technical assessment will address the following: • Hydrograph modification (flow volume, duration, and rate); • A wide range of flow events and continuous flow modeling; • Effects of imperviousness; • Evaluation of downstream affects (stream stability); • Buffer zone requirements; and • Water quality impacts. The assessment should result in:

Item Number	SWMP Section	Subject	Issue	Required Revisions
				• Numeric criteria for runoff rate, duration, and volume control for development and redevelopment projects; • Numeric criteria for stream stability impacts for development and redevelopment projects; • Identification of areas within the University where these criteria must be met; • Specific performance and monitoring criteria for installed hydromodification control infrastructure; • Riparian buffer zone requirements; and • Appropriate hydromodification controls measures such as LID concepts, on-site hydrologic and water quality controls, and in-stream controls.
8	New Development BMPs	Runoff Treatment	The SWMP only discusses treatment of runoff from new parking lots and roads. Runoff from other pollutant generating development (restaurants, residences, operations centers, fueling areas, vehicle maintenance, etc.) must also be treated. A list of the types of new development from which runoff must be treated is needed. Identification of the design storm for treatment of runoff from these types of new development is	Identify a list of the types of new development from which runoff must be treated, including restaurants, residences, operations centers, fueling areas, and vehicle maintenance areas. Identify the design storm for treatment of runoff from these types of development.

Item Number	SWMP Section	Subject	Issue	Required Revisions
			also needed.	
9	Section 4.2.5.2	Application of New Design Standards	The SWMP states that "changes in design requirements may not be expressed in construction projects for three or four years." However, the SWMP does not identify the stage in the project planning, design, and funding process that will be used as the cut-off point to determine which projects in the development pipeline will be subject to new design requirements.	Identify the stage in the project planning, design, and funding process that the University will use as the cut-off point to determine which projects in the development pipeline will be subject to new design requirements. For projects in the planning, design, and funding process at the time the new design requirements take effect, the cut-off point must be chosen in order to apply the new design requirements to as many projects as feasible.
10	Section 4.2.5.3	Long-term Watershed Protection	While the general text of the SWMP mentions that area plans will consider long-term watershed protection, the SWMP does not include a BMP for incorporating long-term watershed protection into area plans. In addition, the SWMP does not discuss incorporating long-term watershed protection into other planning processes (long-range development plans, policies, standards, etc.). To ensure the goal of long-term watershed protection is achieved, quantifiable measures for watershed protection must be developed as part of this planning. The University needs to develop a specific BMP committing to these tasks.	Include a BMP stating how and when the University will 1) develop where feasible quantifiable measures that indicate how the University's watershed protection efforts relative to stormwater management achieve desired watershed conditions; 2) evaluate existing watershed protection efforts, including: long range development plans, area plans, policies, standards, guidance manuals, and BMPs; and 3) adapt or change the existing efforts as needed to achieve long-term watershed protection.
11	Section 4.2.5.3	Riparian Buffers	The SWMP states that "adequate" buffers for riparian areas will be	Include a BMP to establish 30-foot buffers for water bodies to protect them from

Item Number	SWMP Section	Subject	Issue	Required Revisions
			developed, but does not provide any information regarding how adequacy will be determined. This lack of specificity results in uncertainty regarding the level of protection water bodies will receive. The Water Board's Basin Plan requires 30-foot buffers wherever possible.	encroachment from new development and redevelopment. For situations where 30-foot buffers are not feasible, describe the process the University will use to ensure adequately sized buffers will be used. Include in the process evaluation of buffer size within the context of healthy functioning watersheds.
12	BMPs # 68, 77, and 78	Effectiveness Measurement	The effectiveness measurement identified for this BMP does not assess the effectiveness of the BMP. The number of illicit discharges reported or detected does not reflect the effectiveness of road, parking lot, and MS4 sweeping/cleaning.	Modify BMPs # 68, 77, and 78 to include effectiveness measurements that the University can use to assess the effectiveness of each BMP, such as measuring the amount of material collected during sweeping/cleaning.
13	BMP # 75	Effectiveness Measurement	The University's cover letter for the revised SWMP states that effectiveness of this BMP is assessed during preparation of the industrial storm water annual report. This information should be included in the SWMP, including a description of how the University assesses effectiveness.	Modify BMP # 75 to include a description of the effectiveness assessment that is conducted for this BMP, including assessment of storm water monitoring data collected at the facility.
14	BMP # 63	Inspections	While the SWMP includes inspections of hazardous material storage areas, it does not include inspections of other potential pollutant generating "municipal" locations and activities, such as the Central Garage.	Include a BMP for conducting inspections of potential pollutant generating "municipal" locations and activities, such as the Central Garage.
15	Monitoring	Monitoring	The University conducts storm water monitoring, but does not describe the monitoring in the SWMP. Monitoring is	Include a description of the monitoring program, including the purpose of the monitoring, as well as a discussion of its

Item Number	SWMP Section	Subject	Issue	Required Revisions
			an important aspect of a stormwater program, and therefore must be described in the SWMP.	frequency, locations, and constituents monitored. Also commit to reviewing the monitoring program, and modifying it as necessary, in order to ensure the monitoring program includes collection of sufficient water quality data needed to assess the impact of runoff on water quality within the karst system. Potential required monitoring plan modifications would not exceed the addition of one more monitoring site and the addition of one more annual monitoring event to the existing analytical suite, unless directed under a separate order. Subsequent monitoring requirements may be reduced, based on analytical results collected.
16	BMP # 108	Effectiveness Measurement	The SWMP does not discuss using monitoring data to assess program effectiveness.	Modify BMP # 108 to commit the University to using monitoring data to assess program effectiveness. Also commit to presenting the effectiveness assessments using monitoring data in the University's annual reports.

ATTACHMENT 2

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

Response to Comments
University of California Santa Cruz Storm Water Management Plan September 2008

Introduction

This document includes California Regional Water Quality Control Board, Central Coast Region (Water Board) staff responses to the comments received during the Water Board's 60-day public comment period (November 3, 2008 – January 5, 2009) for the University of California Santa Cruz (UCSC) Storm Water Management Plan (SWMP) and Water Board staff's Draft Table of Required Revisions. Water Board staff received comments from the following individuals and organizations:

January 2, 2009:	Robert Curry, Ph.D., P.G., Watershed Systems
January 5, 2009:	Don Stevens, Habitat and Watershed Caretakers
January 5, 2009:	Grey Hayes, Ph.D.
January 7, 2009:	Kim Busby, California Polytechnic State University, San Luis Obispo

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Comments from Robert Curry

Comment: These comments are intended to focus on those aspects of the University of California Santa Cruz SWMP that primarily cover new construction and or development on the main 1156 High Street campus. It is the many issues of storm water management that will be associated with the greater than 3 million square feet of development now proposed for the campus primarily in undeveloped easily-eroded sensitive soil and habitat areas that is my primary concern.

Response: The SWMP includes numerous requirements to be applied to new construction and development projects to prevent erosion and other impacts to habitat areas. Best Management Practices (BMPs) # 48 – 60 target pollutants and impacts resulting from construction and new development, including erosion and hydromodification. Water Board staff finds these measures to be a substantial set of construction and new development BMPs.

Comment: A second serious concern is the issue of standards and enforcement. The University is its own regulator. As the SWMP states (p. 12) " Because UC serves as both the public agency and project proponent for construction sites on University properties..." there is a potential conflict with use of self-imposed and self-monitored BMPs to insure nondegradation of water quality.

Response: The Water Board regulates UCSC's implementation of its SWMP. Through approaches such as report review, inspections, audits, and enforcement, Water Board staff will ensure that UCSC implements all aspects of its SWMP. If UCSC neglects to implement BMPs or implements them inadequately such that construction activities cause, or threaten to cause, waste discharges, the Water Board will use other regulatory and enforcement tools.

Comment: The revised final SWMP of October, 2008, is not at all easy to read or interpret. It is basically a web-based document with deeply nested links and complex interconnections. It is certainly not an easily-digested public document but is instead a complex bureaucratic system of somewhat independent policies and pronouncements that are purported to guide many parties and kinds of individual actions to achieve a broad and rather vague set of goals. The primary substantive portion of the document is buried in Appendix A, titled as Best Management Practices – Details. However, the actual BMP standards and details are in many important cases not in that appendix, but are in other Campus Standards documents such as "Site Requirements" http://ppc.ucsc.edu/standards/part3.pdf/ .

Response: The SWMP includes several layers of complexity, reflecting the general complexity of the task of stormwater management. For general information, the SWMP is organized into chapters according to the six minimum control measures identified in the Federal Regulations and General Phase II Municipal Stormwater Permit. More detailed information for each of the six minimum control measures is included in the BMP descriptions found in Appendix A. Many BMPs included in Appendix A are further expanded upon through the use of web links to pertinent documents. Water Board staff finds this approach of providing increasing levels of complexity within the SWMP to be a reasonable method for dealing with a widespread program that operates within numerous departments at UCSC.

Comment: Crude templates for estimating storm water volumes are found at http://ppc.ucsc.edu/standards/swpppteмplate/ but these are simply standard civil engineering approximations and not really appropriate to UCSC site conditions of soil and rainfall. For example, the worksheets subdivide all construction into "impervious" and "pervious" areas with no intergradations.

Response: The templates referred to in the comment are for use during development of Storm Water Pollution Prevention Plans, which are meant to prevent erosion and sedimentation during the construction phase of development only. As such, any structures (such as detention basins) designed according to the templates will be temporary. Water Board staff finds the straightforward calculation methods included in the templates to be appropriate for design of temporary construction measures. More rigorous methods for calculating design components of permanent structural BMPs are discussed at BMPs # 55.5 and 55.7, as well as items 5, 6, and 7 of the Table of Required Revisions.

Comment: New development on the UCSC campus is covered primarily by BMPs 55 through 60 in Appendix A of the SWMP. BMP 55 is the more detailed multipart guideline that deals with runoff rates and (after July, 2009) volumes. This BMP deals with what the Regional Board has been referring to as "hydromodification". Part 19 of section 55.7 states:

> 19. Runoff from parking lots > 5,000 sq. ft. will be treated for oil, grease and sediment before being released. Volume based treatment will be calculated using either the 85th percentile, 24-hour storm event or 80 percent of the annual runoff volume. Flow based treatment will be calculated using either the 85th percentile hourly rainfall intensity, multiplied by a factor of two or 10 percent of the 50 year peak flow.

Similar BMPs address new roads and other specific large scale new construction while others cover smaller new projects with less specificity. Although the 5000 sq ft cutoff is an improvement over the earlier version, the primary failing of all of the BMP criteria remains lack of specificity. Although the language suggested by the Regional Board was adopted for larger parking lots and roads, the bases of the calculations are not addressed. Will the suggested two times published rainfall intensity be applied? Based on the early campus rainfall mapping by Ray Collett, the 2X value is fully justified for upper campus where as much as 100 annual inches may occur in big storm years.

Response: While the UCSC SWMP only addresses treatment of runoff from roads and parking lots, Water Board staff has required in its Table of Required Revisions that UCSC treat runoff from all pollutant generating development (item 8). This Table of Required Revisions item requires UCSC to identify in its SWMP the specific types of pollutant generating development (including restaurants, residences, operations centers, fueling areas, vehicle maintenance areas, etc.) from which runoff must be treated. UCSC must require all pollutant generating development types (including those listed above) to use volume- or flow-based treatment systems addressing runoff leaving the development projects. When flow-based treatment systems are used, they must be adequately sized so as to treat the maximum flow rate of runoff produced by the 85th percentile hourly rainfall intensity, multiplied by a factor a two, or the flow rate that represents 10 percent of the 50-year peak flow. Treatment of the 85th percentile hourly rainfall intensity, multiplied by a factor a two, is a protective design criteria used throughout many locations of California and is included in the General Phase II Municipal Storm Water Permit. Treatment of 10 percent of the 50-year peak flow is roughly equivalent to use of the 85th percentile criteria, and provides an alternative design criteria that can be useful depending upon the data available for BMP design.

Comment: A contemporary high quality remote rainfall and storm-flow monitoring network should be an important part of any SWMP.

Response: UCSC must determine the 85th percentile 24-hour storm events and the 85th percentile hourly rainfall intensities for the various parts of campus where development will occur. Water Board staff expects interpolation and extrapolation from existing rainfall gauges and isopleth maps to be sufficient for this purpose. The SWMP and Table of Required Revisions also require UCSC to assess the effectiveness of its efforts to control runoff flows. As indicated at BMP # 108.2, UCSC will identify in Year 3 assessment tools to be used to assess the effectiveness of the SWMP in protecting receiving water quality. To assess the effectiveness of runoff flow control, UCSC will ultimately need to monitor storm flows or develop other equally effective effectiveness assessment tools.

Comment: The present SWMP still does not include specific numeric standards and limits to insure no further degradation of storm-water runoff. This exemplified by BMP 55.3:

> Implementation Plan
> Main campus projects funded for design after July 2009 that increase impervious surface will be required to provide volume control to the maximum extent practicable.
> The campus has set the applicability level for this task to capital projects that increase impervious surface. In order to ensure maximum extent practicable is achieved the campus plans to have design professionals utilize a narrative checklist of LID [low-impact development] practices.

The critical shortcoming of this approach is the phrase "maximum extent practicable". Simply having "design professionals" utilize an unspecified "narrative checklist of LID practices" is insufficient. It does not address the specific requirements of the Phil Hammer letter of July 2008. Throughout the BMPs that are the core of the SWMP, similar calls for "effective filtration"... and "minimize erosion" or similar phrases are used. These recommendations lack specificity sufficient to assure nondegradation, despite Regional Board staff recommendations to the contrary. For example, rather than calling for effective filtration, the BMPs should require specific setbacks and vegetative buffers wherever the campus karst swallow-holes are used for storm drainage. The buffers should be designed to capture sediment and debris entrained in the runoff and should be monitored and maintained to insure effectiveness. It is too late for fixed setback requirements in much of the campus but structural sediment traps such as that built near the West Remote parking lot can be used in place of natural capture capacity.

As the Water Board has previously stated in reference to the 2005 UCSC EIR [Environmental Impact Report] admission that there would be significant and unavoidable degradation of watersheds, "This is not an acceptable determination under current conditions" 1. The SWMP must insure that the predicted degradation does not occur. We need clear measurable goals and specificity that are directly stated in the SWMP, not something that is simply left to future design professionals. For example, we need specific criteria that specify setbacks from karst sinkholes and specific standards for protection and enhancement of vegetative buffer strips or riparian zones along campus drainageways.

Response: The SWMP and Table of Required Revisions include adequate language to ensure that numeric criteria will be developed to control hydromodification and pollutant discharges. For example, BMP # 55.3 (cited in the comment) must be considered in conjunction with BMP # 55.5 and items 5, 6, and 7 of the Table of Required Revisions. While BMP # 55.3 includes a robust method for optimizing implementation of low-impact development techniques at new development and redevelopment projects, BMP # 55.5 and items 5, 6, and 7 of the Table of Required Revisions are the mechanisms that ensure development of adequate numeric criteria for hydromodification control. BMP # 55.5 commits to controlling post-development runoff flow rates and durations to match pre-development flow rates and durations for those flows that exert the most work on receiving channels. Likewise, items 5 and 6 of the Table of Required Revisions ensure that interim hydromodification control criteria are developed that are as effective as the criteria developed by Water Board staff. Item 7 further requires UCSC to develop long-term hydromodification criteria. The numeric criteria that UCSC will develop as a result of these components, combined with the low-impact development optimization approach of BMP # 55.3, will prevent hydromodification resulting from new development and redevelopment. Likewise, the pollutant control aspects of BMP # 55.3 are also augmented by BMP # 55.7 and item 8 of the Table of Required Revisions. Combined, these provisions ensure that runoff from all pollutant generating new development is treated, in addition to the low-impact development provisions of BMP # 55.3.

All of the above requirements will protect the karst system from impacts resulting from new development and redevelopment. The numeric criteria for hydromodification control will maintain erosive flows at pre-development rates and durations, preventing new channel erosion and sedimentation at sinkholes. Similarly, the numeric criteria for runoff treatment will prevent pollutants from new development from entering the karst system. In addition, item 11 of the Table of Required Revisions requires UCSC to establish 30-foot buffers for water bodies, which include sinkholes. Where 30-foot buffers are not feasible, UCSC must develop a process to determine appropriate buffers within the context of healthy functioning watersheds.

Comment: The Science Hill hydrologic protection web site is an example of positive campus efforts (http://cleanwater.ucsc.edu/science_hill_map_page.html). To this should be added updates on effectiveness monitoring that encourage public feedback and observation and that post storm-flow photos and runoff measurement information. Use of monumented photo-stations and on-line posting of storm runoff discharge characteristics and sediment loads would then allow campus citizens to corroborate BMP effectiveness and provide a checks-and-balances approach to the otherwise self-regulating BMP monitoring strategy.

Response: Item 16 of the Table of Required Revisions requires UCSC to use its monitoring data while conducting its effectiveness assessments. These effectiveness assessments will be included in UCSC's annual reports. Since UCSC's SWMP web page will be updated quarterly, Water Board staff expects the annual reports to be made available on the web page. This approach will allow the public the opportunity to review and provide feedback on SWMP implementation and monitoring data.

Comment: Wetlands are a natural filter to capture storm runoff and sediment and there are many acres of wetlands on the UCSC campus. The SWMP acknowledges the import of wetland protection but has no map or link to a map that locates these features. In the past, UCSC has built stormwater detention facilities that have become wetlands. The campus has allowed such facilities to remain even when filled with sediment rather than absorbing the costs of maintenance and permitting to allow work in statutory wetlands. As the Regional Board staff have recommended, a wetland map should be prepared. For stormwater purposes, it does not need to delimit statutory wetlands but should include places that function to detain and infiltrate stormwater and capture sediment. Policies should protect and/or enhance these features.

Response: As a planning level document, the SWMP does not need to include detailed maps of all wetlands located on campus. Instead, the SWMP must include commitments for protection of wetlands. The Table of Required Revisions requires at item 11 that UCSC include in the SWMP a commitment to establish 30-foot buffers for water bodies (including wetlands), and develop a process for evaluating appropriate buffer size within the context of healthy functioning watersheds for situations where 30-foot buffers are not feasible. In addition, the SWMP includes commitments for protection of wetlands at section 4.2.5.3, where it states:

> "[...] the campus has several land use designations which are not planned for development under the 2005 LRDP [Long Range Development Plan]. Most wetlands and riparian lands are included in these designations. To the limited extent that development is allowed in or near riparian and wetland areas, the 2005 LRDP requires mitigation of potential impacts associated with the riparian areas, wetlands, and provides buffer zones as needed. The development that might occur in these areas is limited to projects such as bridge crossings and drainage improvement projects."

It must also be noted that any placement of fill in wetlands is regulated directly by the Water Board through its Clean Water Act section 401 Water Quality Certification and Waste Discharge Requirements programs. Water Board staff will review all proposed impacts to wetlands as part of these programs, including cumulative impacts.

Regarding maintenance of detention basins, UCSC commits to annual inspection and maintenance at BMP # 78.

Comment: Use of the campus karst system for stormwater capture and transport is also acknowledged in the SWMP. Good maps do exist and some studies have been conducted to outline known and definite subsurface karst channels. These are important parts of any UCSC main campus SWMP and should be addressed directly with estimates of capacity and protective measures to avoid siltation of the features.

Response: The SWMP includes BMPs to protect sinkholes from siltation and maintain capacity. BMPs # 48, 51, and 54 address control of erosion and sedimentation resulting from construction activities. BMPs # 55, 56, 59, and 60 address erosion and sedimentation resulting from new development and alteration of runoff flows. BMP # 100 addresses maintenance of drainage channels, and includes maintenance of sinkhole capacity.

Comment: The regional Santa Cruz karst system is recharged entirely on the UCSC central and southern campus. This karst system supplies water to the many springs that were the primary impetus for development of Santa Cruz as a regional center for the Mission, subsequent agriculture, and later for a City. The Regional Board needs to clearly understand that karst drainage is underground. That is, biological processes and light that contribute to capture and breakdown of pollutants is not available to waters draining through karst passages. Because you cannot access karst systems easily, you cannot expect to capture and clean up any spills. Drainage into karst systems must be kept clean before it flows underground. Traditional Water Quality Control Board regulations are not sufficient for subsurface known and definite channels.

Response: The SWMP includes BMPs designed to reduce the discharge of pollutants to the maximum extent practicable and protect water quality. Water Board staff expects these BMPs will be protective of all receiving waters, including waters within the karst system. However, due to the unique conditions of the karst system, there is uncertainty regarding the quality of water within the karst system that has been impacted by urban runoff. In order to better understand the impact of urban runoff on water quality within the karst system, Water Board staff has revised the Table of Required Revisions at item 15 to require UCSC's monitoring program to include a component designed to assess the impact of runoff on water quality within the karst system. In addition, Water Board staff has modified item 16 to require that assessment of monitoring data be included in UCSC's annual reports.

Comment: Almost the entire campus is underlain by thick clay-rich soils of various degrees of development. Most are quite old, meaning greater than 250,000 years old, and characterize the stair-step sequence of marine terraces raised by the uplift of Ben Lomond Mountain through late Tertiary and Quaternary geologic times. These once-flat lying marine surfaces are inherently poorly drained and thus developed soils that are characterized by thick relatively impermeable clay layers. Many of the deeply altered geomorphic land surfaces are altered to depths of 15-25 feet.

The widespread but discontinuous assemblage of mica-schist and limestone bedrock that forms the central and southern developed parts of the University lands is laced with caves, sinkholes, and solution features that have developed at progressively deeper levels below the ground surface as the campus site has been uplifted along the rising flank of Ben Lomond Mountain. The campus karst system is vulnerable to plugging by erosion of the local soils. The Oakes College erosion shown in the EH&S [Environmental Health and Safety] photo is carried directly

into a swallow hole just above the campus Arboretum. That part of the karst plugs periodically and floodwaters then spill off the campus through Moore Creek and other surface drainages.

The geology of the Upper or North campus area is markedly different than that of the presently-developed campus area. It is characterized by intrusive granitic rocks that form an altered zone where they contact the older marine mudstone and limestone that became the mica-schist and marble as the granite was intruded. On top of this throughout the campus is a discontinuous layer up to 20 or more feet deep of marine beach sand or shallow offshore deposits formed in the wave zone as the land rose relative to sea-level, which was itself alternating 300 feet or more with each Pleistocene glacial-interglacial cycle. The marine layer under the uppermost parts of the campus is different from that elsewhere in that it is made up of sands eroded and washed in from the immediately adjacent granite bedrock of Ben Lomond Mountain.

Some geologic maps of the upper campus marine deposit classify it as the Santa Margarita Sandstone Formation. It looks somewhat like that deposit that is found to the east in Scotts Valley and forms an important groundwater aquifer in many parts of the region. However, excavation and augering reveal that it is probably not the Santa Margarita (Joe Clark, personal communication) because it is just a thin (± 20-foot) surface deposit over granite and mica-schist bedrock. It thus cannot carry surface drainage into deeper aquifers. Throughout its several million years of existence, it has become repeatedly saturated in winters or wet times and has largely decomposed into a thick very tight clay. The many seasonal wetlands in the Upper Campus and Marshall Field area attest to the very slow permeability of this site during today's rainy seasons. Unlike the very permeable Santa Margarita sandstone that is being mined nearby as a source of silica for making fiberglass insulation, the Upper Campus "Santa Margarita" is feldspar-rich rather than mostly quartz-rich as is the classic Santa Margarita Formation.

The thick clays of the upper campus that have developed on these highest marine sands are very erosive as has been pointed out by the Kennedy-Jenks/Balance Hydrologics consulting report cited in the latest UCSC draft SWMP. That report states:

"Should development occur on the North Campus, caution should be exercised because many portions are susceptible to high rates of erosion if disturbed. This is balanced by the presence of Santa Margarita sandstone, which can infiltrate water readily, if not significantly disturbed." (Storm Water and Drainage Master Plan p. E-5)

Because the scope of development planned in the Upper Campus (over 2 million square feet) is so large, it is vital that storm water management designs be based on the clear understanding of the actual conditions. As I pointed out in my earlier letters, the Regional Board's Phase II permit should probably include a clause requiring a detailed water-balance model study, wetlands delineation, and actual analyses of proposed hydrologic modifications. Otherwise, there will be a high risk of substantial erosion and environmental degradation despite the BMPs. The modeling should include realistic storm-water flow volume calculations, not simply text-book probabilistic rainfall-runoff figures. For example, the Ray Collett actual rainfall data throughout the campus during its early development phase indicated higher large-storm totals for the upper campus (Marshall Field) area than is used for the present SWMP hydromodification mitigation BMPs. A reader needs to know how often and under what conditions excess incremental stormflow volumes may be discharged for any proposed development.

Response: As part of its requirements for new development and redevelopment, UCSC has committed to controlling flows so that pre- and post-project flow rates and durations match for

the range of flows that exert the most work on the receiving channel (BMP # 55.5). Likewise, Water Board staff has required development of effective numeric hydromodification criteria at item 6 of the Table of Required Revisions. In order to achieve these standards for projects at the North Campus and elsewhere, UCSC will need to conduct detailed analyses of existing conditions and develop detailed storm water management designs. By conducting project specific soil and hydrology analyses, applying hydromodification and infiltration requirements, and subsequently developing detailed storm water management designs, UCSC will prevent erosion and associated beneficial use degradation resulting from new development and redevelopment projects.

Comment: The point-source implications of storm-water management through continued reliance on the campus karst system raises many water quality concerns. The present playing fields in karst terrain are feeding nitrates and probably other contaminants to the off-campus spring systems such as the Pogonip springs and Kalkar Quarry. The campus will have to develop considerable stormwater detention and treatment facilities if they intend to continue using the karst groundwater as a receiving system. Much of that system now comprises "known and definite channels" and as such is a protected water of the State and subject to non-degradation requirements. Although the BMPs in the SWMP call for "adequate filtration" and protection of drainageways that lead to swallow-holes and similar features, we are not told how this is to be accomplished, maintained, or monitored. Simple statements about an "effectiveness" criterion in the BMP do not insure that the BMP practice can actually be implemented.

Response: The SWMP is designed to reduce the discharge of pollutants to the maximum extent practicable and protect water quality. This is achieved through the implementation of BMPs. BMPs are frequently categorized in terms of source control and treatment BMPs. Source control BMPs are often used as a first line of defense, with treatment BMPs used for augmentation when source control BMPs are found to be insufficient. This is especially true regarding existing development, where installation of treatment BMPs can involve complicated and extensive retrofitting. UCSC's SWMP includes implementation of a full suite of source control BMPs for existing development on campus. For example, lawn care practices are addressed at BMP # 81. In addition, UCSC implements many treatment BMPs as well. Water Board staff expects these source control and treatment BMPs to be protective of all receiving waters, including waters within the karst system. Following implementation of these BMPs, where evidence exhibits that they are inadequate and water quality degradation is occurring, Water Board staff will require additional BMPs. However, due to the unique conditions of the karst system, there is uncertainty regarding the quality of water within the karst system that has been impacted by urban runoff. In order to better understand the impact of urban runoff on water quality within the karst system, Water Board staff has revised the Table of Required Revisions at item 15 to require UCSC's monitoring program to include a component designed to assess the impact of runoff on water quality within the karst system. In addition, Water Board staff has modified item 16 to require that assessment of monitoring data be included in UCSC's annual reports.

Comment: The University of California Santa Cruz revised final SWMP for the main campus site is not yet adequate to insure further non-degradation of campus stormwater runoff. With an admitted projected increase in storm-flow volume that will be associated with future development of over 3 million square feet of new facilities and the associated roads, parking lots, and utility infrastructure, the SWMP should have demonstrated that new construction can

result in zero increased discharge rather than a vague "low impact" or should have shown how the many existing high-impact erosive storm-flow scars and channels can be restored to mitigate future development to insure no net increase in storm-flow volume and sediment discharge.

Numeric standards and criteria are not yet sufficient. Roads and parking lot projects less than 5000 sq. ft. and buildings themselves need to have clear policy directives that limit runoff rate and volume increases or that set standards for offsite mitigation of onsite sediment and runoff impacts.

Response: The SWMP and Table of Required Revisions include adequate language to ensure water quality and beneficial use degradation will not occur. UCSC will develop numeric criteria to control hydromodification and pollutant discharges resulting from new development and redevelopment. For example, BMP # 55.3 includes a robust method for optimizing implementation of low-impact development techniques at new development and redevelopment projects. In conjunction, BMP # 55.5 and items 5, 6, and 7 of the Table of Required Revisions ensure numeric criteria for hydromodification control for all projects that create more than 5,000 square feet of impervious surface. BMP # 55.5 commits to controlling post-development runoff flow rates and durations to match pre-development flow rates and durations for those flows that exert the most work on receiving channels. Likewise, items 5 and 6 of the Table of Required Revisions ensure that UCSC develops interim hydromodification control criteria that are as effective as the criteria developed by Water Board staff. Item 7 further requires development of numeric long-term hydromodification control criteria. The numeric criteria that UCSC will develop as a result of these components, combined with the low-impact development optimization approach of BMP # 55.3, will prevent hydromodification resulting from new development and redevelopment with more than 5,000 square feet of impervious surface. Likewise, the pollutant control aspects of BMP # 55.3 are also augmented by BMP # 55.7 and item 8 of the Table of Required Revisions. Combined, these provisions ensure that runoff from all pollutant generating new development (not just roads and parking lots) will be treated, in addition to the low-impact development provisions of BMP # 55.3.

While road and parking lot projects smaller than 5,000 square feet are not held to numeric criteria, other BMP requirements apply. For example, BMP # 55.3 specifies that small projects must implement low-impact development measures according to the low-impact development checklist included as Appendix H. These low-impact development measures will help control both flows and pollutants generated by small projects. In addition, the source control BMPs of BMP # 55.7 generally apply to all projects. Water Board staff finds that this less stringent approach to controlling runoff from small projects is appropriate because of the reduced threat from these projects. In addition, such an approach can encourage infill development and avoid impacts associated with new development located outside core development areas.

Comments from Don Stevens, Habitat and Watershed Caretakers

Comment: I believe the UCSC SWMP has serious deficiencies and should not be adopted unless it is significantly revised to include greater specificity and measurable goals that can be clearly understood by the public. The fundamental goal should be to improve the overall health of existing watersheds and receiving waters, but it is likely that the four major watersheds on campus will be significantly degraded by increased erosion in the corning years because of

massive UCSC development plans and a lack of specific and cumulative analysis and measurable and enforceable goals in the current plan.

Response: Wherever applicable, Water Board staff has required each BMP in the SWMP to have an associated measurable goal. This include BMPs designed to address erosion and hydromodification resulting from new development. For example, BMP # 55, as well as items 5, 6, and 7 in the Table of Required Revisions, require UCSC to develop and implement both interim and long-term numeric hydromodification criteria for new development and redevelopment. Likewise, Water Board staff requires numeric criteria for treatment BMPs for all pollutant generating new development and redevelopment at item 8 of the Table of Required Revisions. Water Board staff finds these specific measurable goals and numeric criteria to be sufficient to protect UCSC's watersheds and receiving waters.

Comment: UCSC presents an inaccurate narrative claiming excellent environmental stewardship over the decades when the opposite is the case for the most part. UCSC does not have a conventional storm water infrastructure system, its watersheds have experienced severe erosion, and UCSC has followed an unsound practice of directing large post-development, unfiltered, polluted storm water flows into the sinkholes of the karst system (see photos under separate cover), polluting its stored ground water. The major sinkholes have silted up over time and now lack adequate capacity for storm water conveyance, leading to still more erosion (see the 2004 Kennedy-Jenks study).

Response: While the drainages on campus have experienced erosion, the SWMP includes significant measures to correct this erosion and prevent further erosion. BMP # 100 discusses two large stabilization projects worth approximately $5,400,000 designed to address existing erosion and sedimentation at numerous drainage locations throughout the campus, including sinkholes. These projects are specifically designed to address the recommendations of the 2004 Kennedy-Jenks study. Likewise, BMP # 55.5 and items 5, 6, and 7 of the Table of Required Revisions ensure UCSC develops numeric criteria for hydromodification control. BMP # 55.5 commits to controlling post-development runoff flow rates and durations to match pre-development flow rates and durations for those flows that exert the most work on receiving channels. In addition, items 5 and 6 of the Table of Required Revisions ensure that UCSC develops interim hydromodification control criteria that are as effective as the criteria developed by Water Board staff. Item 7 further requires UCSC to develop numeric long-term hydromodification control criteria. The numeric criteria that UCSC will develop as a result of these components, combined with the low-impact development optimization approach of BMP # 55.3, will prevent hydromodification resulting from new development and redevelopment on campus.

Comment: One glaring shortcoming of the SWMP is that UCSC has failed to provide any details about its 2005-2020 Long Range Development Plan (LRDP) that calls for over 3 million square feet of new development, including over 2 million square feet in the currently undeveloped upper campus with soils that are highly susceptible to erosion if disturbed (according to the Kennedy-Jenks study).

Response: The SWMP is not a development plan. As such, it is not required to identify the amount of development that is planned to occur at UCSC. However, the SWMP does include extensive requirements to be applied to new development by UCSC. These requirements

adequately address the threat to water quality and beneficial uses posed by new development at UCSC.

Comment: UCSC failed to mention in the SWMP that Section 4.8.2.4 of the EIR (LRDP Impact HYD-3) for the 2005-2020 LRDP determined there would be significant and unavoidable erosion and degradation of the watersheds. This seems to me to be directly at odds with the purpose of the Phase II program.

For your reference and for the record, I would like to include a portion here of the December 19, 2005 Water Board comment letter to UCSC and include the entire letter as an attachment to this document. The Water Board correctly pointed out serious problems at UCSC that were not resolved in the FEIR and are not addressed in the current SWMP.

> ***"Stormwater Source Control***
>
> *Water Board staff is concerned that existing and foreseeable future erosion and sedimentation issues are not being addressed at the source of the problem as development continues through the proposed expansion of the UCSC campus. UCSC has experienced extensive erosion and excessive sedimentation to its natural drainage system that is largely due to increased runoff from impervious surfaces. Future development will add more impervious surface to the UCSC campus, thus exacerbating the erosion and sediment problems. Water Board staff has concerns with regards to erosion, sedimentation, urban pollutants, and the lack of source stormwater controls. The following are some specific examples that validate these concerns:*
>
> 1. *The Stormwater and Drainage Master Plan states, "On-going channel incision is so severe in many campus drainages that it is a significant consideration with regard to the use of natural drainage channels for stormwater conveyance, and limits future development options" (Kennedy/Jenks Consultants 2004).*
>
> 2. *Many of the campus sinkholes used for stormwater discharge conveyance are at capacity from increased sedimentation, resulting in downstream flooding, increased sediment, and urban pollutant loads to creeks and other water bodies.*
>
> 3. *The eastern portion of campus that drains to the San Lorenzo River Watershed is currently receiving concentrated stormwater runoff, contributing to deep incision, channel bank failure, and erosion to the San Lorenzo Watershed. This raises a particular concern since the San Lorenzo River is currently listed under the Clean Water Act 303(d) list for sediment impairment.*
>
> 4. *The Stormwater and Drainage Master Plan states, "Any future development to the North Campus area is prohibited due to heavy erosion from increase in surface runoff as a result of increased impervious area" (Kennedy/Jenks Consultants 2004). This area is described as having highly erosive soil that relies on natural infiltration to accommodate stormwater flow. However, the Draft EIR proposes an increase from 7 acres to 54 acres of impervious surface, resulting in a 31 percent increase in runoff.*
>
> 5. *Section 4.8.2.4 of the Draft EIR (LRDP Impact HYD-3) is determined significant yet unavoidable. This is not an acceptable determination under current*

conditions. These conditions only exist under conventional stormwater management design and therefore, can be resolved by implementing design standards that control stormwater at the source.

As the University expands, the amount of impervious area that is projected to be added to the campus almost doubles. Along with this comes higher flow rates, greater volume, and increased urban pollutant levels. We feel that a preventative approach must be taken to address these issues so that extensive erosion and sedimentation do not persist.

Proposed stormwater drainage system improvements focus on channel alteration, detention, and diversion of stormwater flows. These improvements may help with existing erosion and sedimentation issues. However, they will not prevent the problem from reoccurring in the future. UCSC Campus Standards Handbook repeatedly states, "Storm drainage design shall provide for detention of stormwater runoff so that the post-development runoff rate does not exceed the pre-development runoff rate." The University is currently not meeting these pre-development runoff standards, resulting in extensive erosion to the campus natural drainage system. Subsequently, stormwater runoff detention addresses peak flow rates but does not address overall volume of stormwater flows. Increased volume still contributes to downstream erosion even when runoff is released at smaller amounts over longer periods of time. In addition, we are concerned that stormwater drainage system improvements may not be implemented before new buildings and other impervious surfaces are constructed, as stated in the Draft EIR section 4.8.2.4 page 33.

We highly suggest that the University takes a preventative approach to erosion control, sedimentation, and urban pollutants by controlling stormwater at the source. To accomplish this we suggest implementing Low Impact Development (LID) Design Standards to all new development and to existing development where feasible. LID captures stormwater at the source, allows stormwater to infiltrate, and prevents further water quality impacts (erosion, sedimentation, and urban pollutant loads) from occurring downstream."

For emphasis, please note that the Water Board stated in the above quoted letter: "Section 4.8.2.4 of the Draft EIR (LRDP Impact HYD-3) is determined significant yet unavoidable. This is not an acceptable determination under current conditions." (Impact HYD-3 is erosion and degradation of the watersheds). However, UCSC in fact adopted this determination in the Final EIR in spite of Water Board comments.

The Water Board now has the opportunity and obligation to require clear and definitive language in the UCSC SWMP to ensure that significant erosion and degradation of the watersheds will not result from new development. The SWMP should assure that new development will not add increased storm water rates, volumes, or durations from pre-development conditions. It should require that development plans be modified, if necessary, to conform to the specific goals of the SWMP. Alternatively, the SWMP should contain the clear goals and specific requirements so that a determination by UCSC that is not acceptable to the Water Board as cited above will not occur.

Response: Water Board staff is aware of our previous comments made to UCSC regarding the Long Range Development Plan Environmental Impact Report, and has reviewed the SWMP to ensure that our previous comments have been adequately addressed. The SWMP includes

definitive requirements that will prevent erosion and hydromodification. For example, BMP # 100 describes projects that will address ongoing existing erosion. The SWMP also includes BMPs to ensure erosion and hydromodification do not occur as a result of new development and redevelopment. BMP # 55.3 optimizes infiltration through the implementation of low-impact development BMPs. BMP # 55.5 requires control of flow rates and durations from new development and redevelopment to prevent hydromodification. Items 5 and 6 of the Table of Required Revisions ensure that UCSC's interim hydromodification control criteria are as effective as the criteria developed by Water Board staff. Item 7 of the Table of Required Revisions requires UCSC to develop a Hydromodification Management Plan, including numeric long-term hydromodification control criteria.

Comment: In another letter dated January 6, 2006 and attached in full to this document, the Water Board stated: "A formal, campus-wide wetland delineation should be performed and incorporated into the 2005 LRDP EIR prior to specific development project proposals and before further evaluation of the 2005 LRDP DEIR." However, UCSC declined to conduct the campus-wide wetland delineation.

Response: As a planning level document, the SWMP does not need to include a formal wetland delineation. Instead, the SWMP must include commitments for protection of wetlands. The Table of Required Revisions requires at item 11 that UCSC include in the SWMP a commitment to establish 30-foot buffers for water bodies (including wetlands), and develop a process for evaluating appropriate buffer size within the context of healthy functioning watersheds for situations where 30-foot buffers are not feasible. In addition, the SWMP includes commitments for protection of wetlands at section 4.2.5.3, where it states:

> "[...] the campus has several land use designations which are not planned for development under the 2005 LRDP. Most wetlands and riparian lands are included in these designations. To the limited extent that development is allowed in or near riparian and wetland areas, the 2005 LRDP requires mitigation of potential impacts associated with the riparian areas, wetlands, and provides buffer zones as needed. The development that might occur in these areas is limited to projects such as bridge crossings and drainage improvement projects."

It must also be noted that any placement of fill in wetlands is regulated directly by the Water Board through its Clean Water Act section 401 Water Quality Certification and Waste Discharge Requirements programs. Water Board staff will review all proposed impacts to wetlands as part of the programs, including cumulative impacts.

Comment: There should also be specific recognition of the special considerations for the karst system and appropriate regulations and safeguards. Karst is far more vulnerable to pollution than streams or the ocean. In the case of spill contaminants, there is no way to clean up karst-you can't get to it. We do not know the residence times of water in the karst, whereas mixing and low residence times are more likely in streams and the ocean. Also, there is much less biological activity in the karst than in the ocean or streams/rivers and so the assimilative capacity of karst systems should be considered nil.

For example, there is a large drainage pipe that conveys storm water flows from the Science Hill area including a loading dock area, roads and parking lots that outlets directly into a sinkhole (see photos sent under separate cover). This is something that should not be allowed and

should be addressed in the SWMP. There should be specific rules about development around sinkholes and a set of requirements for a regular monitoring system for storm water flows directed into sinkholes. For you reference, I will attach the Monroe County, Indiana Karst Ordinance, which is an example of the kinds of environmental protective measures that might be included in the SWMP.

Response: The SWMP is designed to reduce the discharge of pollutants to the maximum extent practicable and protect water quality. This is achieved through the implementation of BMPs. BMPs are frequently categorized in terms of source control and treatment BMPs. Source control BMPs are often used as a first line of defense, with treatment BMPs used for augmentation when source control BMPs are found to be insufficient. This is especially true regarding existing development, where installation of treatment BMPs can involve complicated and extensive retrofitting. UCSC's SWMP includes implementation of a full suite of source control BMPs for existing development on campus. For example, the SWMP includes street sweeping and parking lot cleaning (BMP # 77), dry weather outfall screening (BMP # 41), management controls to prevent illicit discharges (BMP # 43), food service BMPs (including cleaning of loading docks)(BMP # 69), fleet services BMPs (BMP # 75), storm drain system inspection and preventative maintenance (BMP # 78), custodial services BMPs (BMP # 85), building exterior maintenance BMPs (BMP # 86), hazardous waste management (BMP # 95), and educational BMPs (BMPs # 1-13). In addition, UCSC implements many treatment BMPs as well. These source control and treatment BMPs are expected to be protective of all receiving waters, including waters within the karst system. Following implementation of these BMPs, where evidence exhibits that they are inadequate and water quality degradation is occurring, Water Board staff will require additional BMPs. However, due to the unique conditions of the karst system, there is uncertainty regarding the quality of water within the karst system that has been impacted by urban runoff. In order to better understand the impact of urban runoff on water quality within the karst system, Water Board staff has revised the Table of Required Revisions at item 15 to require UCSC's monitoring program include a component designed to assess the impact of runoff on water quality within the karst system. In addition, Water Board staff has modified item 16 to require that assessment of monitoring data be included in UCSC's annual reports.

The SWMP also contains requirements for new development similar to those found in the Monroe County ordinance. BMP # 55 requires control of flow rates, volumes, and durations from new development. The BMP also requires treatment of runoff from new development that generates pollutants. In addition, item 11 of the Table of Required Revisions requires 30-foot buffers for water bodies, and development of a process to ensure adequately sized buffers within the context of healthy functioning watersheds where 30-foot buffers are not feasible.

Comment from Grey Hayes

Comment: Your agency may be largely unfamiliar with karst formations as these are rare in your jurisdiction. Please note several unique features of karst which should be of special concern to you as you weigh UCSC's SWMP.

1) karst geology allows direct access to groundwater, presenting important complications for clean water
2) once a pollutant is discharged into karst, clean up is more difficult than pollutants discharged into surface waters. Pollutants entering streams, rivers, or the ocean can be

accessed. Once pollutants enter karst, one must employ methods used for cleaning and monitoring groundwater, which can be much more difficult, expensive, etc.
3) assimilative capacity of karst can be much less than surface waters because biological activity is much less than in rivers, streams, and the ocean. Therefore, standards for clean water need to be held higher.
4) the karst system under UCSC has many endemic species that could be sensitive to water quality. These species should be considered rare and endangered, though they are currently not listed. These aquatic systems, then, should be of special concern to your agency.

I urge you and your agency to consider discharge into karst differently than the surface waters you generally regulate. These systems deserve special levels of protection. UCSC currently discharges directly into sinkholes in at least 4 locations.

Response: The SWMP includes BMPs designed to reduce the discharge of pollutants to the maximum extent practicable and protect water quality. These BMPs are expected to be protective of all receiving waters, including waters within the karst system. However, due to the unique conditions of the karst system, there is uncertainty regarding the quality of water within the karst system that has been impacted by urban runoff. In order to better understand the impact of urban runoff on water quality within the karst system, Water Board staff has revised the Table of Required Revisions at item 15 to require UCSC's monitoring program to include a component designed to assess the impact of runoff on water quality within the karst system. In addition, Water Board staff has modified item 16 to require that assessment of monitoring data be included in UCSC's annual reports.

Comment from Kim Busby, California Polytechnic State University, San Luis Obispo

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Comment: With regards to the UCSC Storm Water Management Plan (SWMP), my primary comment is that UCSC is not a Traditional MS4 [Municipal Separate Storm Sewer System] and should not be subject to the requirements of Traditional MS4s and the February 15th letter. The distinction is important as the EPA [Environmental Protection Agency] and most states have demonstrated by providing language that is less onerous than the permit language for the traditional MS4. The distinction is primarily due to the significant operational/structural differences as well as the institutions ability to raise revenue. Universities (UC [University of California], CSU [California State University] and Community Colleges) in particular may have difficulty complying with restrictive standards.

While staff may have determined that UCSC, UCSB and Vandenberg AFB [Air Force Base] should have requirements according to the February 15th letter, it is premature to require this of NTMS4s [Non-traditional MS4s] until the new Phase II permit has been issued. Please provide the documentation that staff used to make the determination that UCSC, UCSB [University of California Santa Barbara] and Vandenberg AFB should be included in the current enrollment strategy (as indicted in the Dec 2007 enrollment strategy).

I have been working with SWRCB [State Water Resources Control Board] through CASQA [California Stormwater Quality Association] on the development of the new Phase II permit. As you are aware, discussions of the new permit include providing separate or revised permitting language for the Non-Traditional MS4s (NTMS4s). During this process, I have provided several examples including Washington state permits where NTMS4s are asked to comply with different

standards than traditional MS4s to meet MEP [maximum extent practicable] and the Phase II requirements. Why is Region 3 recreating and complicating issues that other regulatory agencies (including other regions) have already analyzed?

Response: Water Board staff is pursuing enrollment of UCSC under the General Phase II Municipal Storm Water Permit based on the threat to water quality posed by UCSC. Staff determined it appropriate to enroll UCSC and apply the expectations of Water Board staff's February 15, 2008 letter to UCSC because of its proximity to sensitive receiving waters (e.g., the ocean and San Lorenzo River), the population it supports (which is comparable to a traditional small MS4), and known, suspected, or anticipated impacts from storm water (e.g., existing stream channel erosion and 3 million square feet of new development anticipated at UCSC).

UCSC's status as a non-traditional MS4 must be considered within the context of its threat to water quality. Similarly, the BMPs included in UCSC's SWMP must be established relative to the risks to water quality posed by UCSC. Thus, the expectations Water Board staff presented in our February 15, 2008 and July 10, 2008 letters are appropriate for UCSC, regardless of its status as a non-traditional MS4.

Another consideration is the capability of UCSC to implement an effective storm water program. Water Board staff finds that UCSC has evolved to meet the challenges of contemporary storm water management. Earlier draft SWMPs submitted by UCSC were of a relatively high quality, indicating a readiness for enrollment and a high level of program implementation. Likewise, the General Phase II Municipal Storm Water Permit anticipated enrollments in 2003. To wait for a reissued permit contravenes the expectations of the existing permit. Delayed enrollment is not simply an administrative issue, but is a water quality issue as well. The longer UCSC remains un-enrolled, the longer its receiving waters are exposed to the impacts of storm water runoff. As such, Water Board staff finds it appropriate to move forward with enrollment at this time.

Watershed Systems
Hydrology - Geology - Soil Science

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January 2, 2009

Phil Hammer
Environmental Scientist
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
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Via email to : phammer@waterboards.ca.gov

Attached please find my comments on the UCSC final Storm Water Management Plan (SWMP). I provided initial general comments on October 26, 2008 before the University released its present "Final Revision" of October, 2008. I include the introductory qualifications portion of my earlier letter here for completeness, and address some of the issues that I still determine to be inadequate as pointed out in your Regional Board letter of July 14, 2008 and in my preliminary review in October.

Respectfully Submitted

Robert R. Curry
Registered Geologist and Hydrologist
California #3295

Review of UCSC Storm Water Management Plan of October, 2008

Dear Mr. Hammer and Central Coast Regional Board,

These comments are intended to focus on those aspects of the University of California Santa Cruz Storm Water Management Plan (SWMP) that primarily cover new construction and or development on the main 1156 High Street campus. It is the many issues of storm water management that will be associated with the greater than 3 million square feet of development now proposed for the campus primarily in undeveloped easily-eroded sensitive soil and habitat areas that is my primary concern. A second serious concern is the issue of standards and enforcement. The University is its own regulator. As the SWMP states (p. 12) *"Because UC serves as both the public agency and project proponent for construction sites on University properties..."* there is a potential conflict with use of self-imposed and self-monitored BMPs to insure nondegradation of water quality.

Background and Qualifications:

I retired from the UCSC faculty in 1995 after a career teaching soil science and hydrology. My on-site work began in 1963-64 as an assistant to the UC Berkeley team that developed the maps and site capability information for the Cowell Ranch as it was being considered for a new University of California campus. I assisted Prof. Rod Arkley in mapping the soils of the ranch site and outlining their capability and constraints on future campus development. I had worked on the Cowell Ranch site in 1961 and 1962 mapping geology and marine terrace deposits under National Science Foundation sponsorship to William C. Bradley and Joe Clark and then, when I was a PhD student at Berkeley in Geology and Geophysics, I was brought on to the UCSC campus planning team under the direction of Prof. Bob Twiss.

In the mid 1970's I worked with a team from the US Geological Survey who were trying to develop quantitative methods for assessing the age of soils and the history of soil development. We chose the UCSC campus as site to conduct detailed geochemical descriptions of the many different soil profiles that had developed there over the last million and a half years. To this end, we excavated a series of 25-foot-deep 100-foot long trenches that were shored with structural steel beams and left open for study and sampling for most of a summer. I located some of these study trenches in the North Campus and Marshall Field areas where significant campus expansion is today proposed.

After I came to UCSC as a faculty member in 1979, I began to teach soil science and soil mapping classes and developed a reasonably complete set of detailed campus soil and geology maps that greatly expanded on the Arkley pre-campus mapping. When teaching hydrology classes, my students completed projects assessing campus karst flow characteristics, inflow and outflow to springs, and campus drainage studies. I thus have been able to develop considerable geotechnical information on the campus site and its surroundings.

The UCSC SWMP:

The revised final SWMP of October, 2008, is not at all easy to read or interpret. It is basically a web-based document with deeply-nested links and complex interconnections. It is certainly not an easily-digested public document but is instead a complex bureaucratic system of somewhat independent policies and pronouncements that are purported to guide many parties and kinds of individual actions to achieve a broad and rather vague set of goals.

The primary substantive portion of the document is buried in Appendix A, titled as *Best Management Practices – Details.* However, the actual BMP standards and details are in many important cases not in that appendix, but are in other Campus Standards documents such as "Site Requirements" http://ppc.ucsc.edu/standards/part3.pdf/ . Crude templates for estimating storm water volumes are found at http://ppc.ucsc.edu/standards/swppptemplate/ but these are simply standard civil engineering approximations and not really appropriate to UCSC site conditions of soil and rainfall. For example, the worksheets subdivide all construction into "impervious" and "pervious" areas with no intergradations. New development on the UCSC campus is covered primarily by BMP's 55 through 60 in Appendix A of the SWMP. BMP 55 is the more detailed multipart guideline that deals with runoff rates and (after July, 2009) volumes. This BMP deals with what the Regional Board has been referring to as "hydromodification". Part 19 of section 55.7 states:

19. Runoff from parking lots > 5,000 sq. ft. will be treated for oil, grease and sediment before being released. Volume based treatment will be calculated using either the 85th percentile, 24-hour storm event or 80 percent of the annual runoff volume. Flow based treatment will be calculated using either the 85th percentile hourly rainfall intensity, multiplied by a factor of two or 10 percent of the 50 year peak flow.

Similar BMP's address new roads and other specific large scale new construction while others cover smaller new projects with less specificity. Although the 5000 sq ft cutoff is an improvement over

the earlier version, the primary failing of all of the BMP criteria remains lack of specificity. Although the language suggested by the Regional Board was adopted for larger parking lots and roads, the bases of the calculations are not addressed. Will the suggested two-times published rainfall intensity be applied? Based on the early campus rainfall mapping by Ray Collett, the 2X value is fully justified for upper campus where as much as 100 annual inches may occur in big storm years. A contemporary high quality remote rainfall and storm-flow monitoring network should be an important part of any SWMP.

The present SWMP still does not include specific numeric standards and limits to insure no further degradation of storm-water runoff. This exemplified by BMP 55.3:

Implementation Plan
Main campus projects funded for design after July 2009 that increase impervious surface will be required to provide volume control to the maximum extent practicable.
The campus has set the applicability level for this task to capital projects that increase impervious surface. In order to ensure maximum extent practicable is achieved the campus plans to have design professionals utilize a narrative checklist of LID practices.

The critical shortcoming of this approach is the phrase "*maximum extent practicable*". Simply having "*design professionals*" utilize an unspecified "*narrative checklist of LID* [low impact development] *practices*" is insufficient. It does not address the specific requirements of the Phil Hammer letter of July 2008. Throughout the BMPs that are the core of the SWMP, similar calls for "effective filtration"... and "minimize erosion" or similar phrases are used. These recommendations lack specificity sufficient to assure nondegradation, despite Regional Board staff recommendations to the contrary. For example, rather than calling for effective filtration, the BMPs should require specific setbacks and vegetative buffers wherever the campus karst swallow-holes are used for storm drainage. The buffers should be designed to capture sediment and debris entrained in the runoff and should be monitored and maintained to insure effectiveness. It is too late for fixed setback requirements in much of the campus but structural sediment traps such as that built near the West Remote parking lot can be used in place of natural capture capacity.

The following photograph of one of the Oakes College drainage swales that was found on the UCSC Environmental Health and Safety web site illustrates the shortcomings of the vague BMP approach espoused in the present SWMP.

Two of the beautiful waterways of Santa Cruz County that UCSC is committed to protecting. (Photos and legend courtesy of UCSC EH&S office)

As the Water Board has previously stated in reference to the 2005 UCSC EIR admission that there would be significant and unavoidable degradation of watersheds, "This *is not an acceptable determination under current conditions*" [1]. The SWMP must insure that the predicted degradation does not occur. We need clear measurable goals and specificity that are directly stated in the SWMP, not something that is simply left to *future design professionals*. For example, we need specific criteria that specify setbacks from karst sinkholes and specific standards for protection and enhancement of vegetative buffer strips or riparian zones along campus drainageways.

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[1] Section 4.8.2.4 of the EIR (LRDP Impact HYD-3) for the 2005-2020 LRDP determined there would be significant and unavoidable erosion and degradation of the watersheds.

The Science Hill hydrologic protection web site is an example of positive campus efforts (http://cleanwater.ucsc.edu/science_hill_map_page.html). To this should be added updates on effectiveness monitoring that encourage public feedback and observation and that post storm-flow photos and runoff measurement information. Use of monumented photo-stations and on-line posting of storm runoff discharge characteristics and sediment loads would then allow campus citizens to corroborate BMP effectiveness and provide a checks-and-balances approach to the otherwise self-regulating BMP monitoring strategy.

Missing from the UCSC SWMP:

Wetlands are a natural filter to capture storm runoff and sediment and there are many acres of wetlands on the UCSC campus. The SWMP acknowledges the import of wetland protection but has no map or link to a map that locates these features. In the past, UCSC has built stormwater detention facilities that have become wetlands. The campus has allowed such facilities to remain even when filled with sediment rather than absorbing the costs of maintenance and permitting to allow work in statutory wetlands. As the Regional Board staff have recommended, a wetland map should be prepared. For stormwater purposes, it does not need to delimit statutory wetlands but should include places that function to detain and infiltrate stormwater and capture sediment. Policies should protect and/or enhance these features.

Use of the campus karst system for stormwater capture and transport is also acknowledged in the SWMP. Good maps do exist and some studies have been conducted to outline known and definite subsurface karst channels. These are important parts of any UCSC main campus SWMP and should be addressed directly with estimates of capacity and protective measures to avoid siltation of the features.

Karst Considerations:

The regional Santa Cruz karst system is recharged entirely on the UCSC central and southern campus. This karst system supplies water to the many springs that were the primary impetus for development of Santa Cruz as a regional center for the Mission, subsequent agriculture, and later for a City. The Regional Board needs to clearly understand that karst drainage is underground. That is, biological processes and light that contribute to capture and breakdown of pollutants is not available to waters draining through karst passages. Because you cannot access karst systems easily, you cannot expect to capture and clean up any spills. Drainage into karst systems must be kept clean **before** it flows underground.

Traditional Water Quality Control Board regulations are not sufficient for subsurface known and definite channels.

Almost the entire campus is underlain by thick clay-rich soils of various degrees of development. Most are quite old, meaning greater than 250,000 years old, and characterize the stair-step sequence of marine terraces raised by the uplift of Ben Lomond Mountain through late Tertiary and Quaternary geologic times. These once-flat lying marine surfaces are inherently poorly drained and thus developed soils that are characterized by thick relatively impermeable clay layers. Many of the deeply altered geomorphic land surfaces are altered to depths of 15-25 feet.

The widespread but discontinuous assemblage of mica-schist and limestone bedrock that forms the central and southern developed parts of the University lands is laced with caves, sinkholes, and solution features that have developed at progressively deeper levels below the ground surface as the campus site has been uplifted along the rising flank of Ben Lomond Mountain. The campus karst system is vulnerable to plugging by erosion of the local soils. The Oakes College erosion shown in the EH&S photo is carried directly into a swallow hole just above the campus Arboretum. That part of the karst plugs periodically and floodwaters then spill off the campus through Moore Creek and other surface drainages.

The geology of the Upper or North campus area is markedly different than that of the presently-developed campus area. It is characterized by intrusive granitic rocks that form an altered zone where they contact the older marine mudstone and limestone that became the mica-schist and marble as the granite was intruded. On top of this throughout the campus is a discontinuous layer up to 20 or more feet deep of marine beach sand or shallow offshore deposits formed in the wave zone as the land rose relative to sea-level, which was itself alternating 300 feet or more with each Pleistocene glacial-interglacial cycle. The marine layer under the uppermost parts of the campus is different from that elsewhere in that it is made up of sands eroded and washed in from the immediately adjacent granite bedrock of Ben Lomond Mountain.

Some geologic maps of the upper campus marine deposit classify it as the Santa Margarita Sandstone Formation. It looks somewhat like that deposit that is found to the east in Scotts Valley and forms an important groundwater aquifer in many parts of the region. However, excavation and augering reveal that it is probably not the

Santa Margarita (Joe Clark, personal communication) because it is just a thin (± 20-foot) surface deposit over granite and mica-schist bedrock. It thus cannot carry surface drainage into deeper aquifers. Throughout its several million years of existence, it has become repeatedly saturated in winters or wet times and has largely decomposed into a thick very tight clay. The many seasonal wetlands in the Upper Campus and Marshall Field area attest to the very slow permeability of this site during today's rainy seasons. Unlike the very permeable Santa Margarita sandstone that is being mined nearby as a source of silica for making fiberglass insulation, the Upper Campus "Santa Margarita" is feldspar-rich rather than mostly quartz-rich as is the classic Santa Margarita Formation.

The thick clays of the upper campus that have developed on these highest marine sands are very erosive as has been pointed out by the Kennedy-Jenks/Balance Hydrologics consulting report cited in the latest UCSC *draft* SWMP. That report states:

> "Should development occur on the North Campus, caution should be exercised because many portions are susceptible to high rates of erosion if disturbed. This is balanced by the presence of Santa Margarita sandstone, which can infiltrate water readily, if not significantly disturbed." (Storm Water and Drainage Master Plan p. E-5)

Because the scope of development planned in the Upper Campus (over 2 million square feet) is so large, it is vital that storm water management designs be based on the clear understanding of the actual conditions. As I pointed out in my earlier letters, the Regional Board's Phase II permit should probably include a clause requiring a detailed water-balance model study, wetlands delineation, and actual analyses of proposed hydrologic modifications. Otherwise, there will be a high risk of substantial erosion and environmental degradation despite the BMPs. The modeling should include realistic storm-water flow volume calculations, not simply text-book probabilistic rainfall-runoff figures. For example, the Ray Collett actual rainfall data throughout the campus during its early development phase indicated higher large-storm totals for the upper campus (Marshall Field) area than is used for the present SWMP hydromodification mitigation BMPs. A reader needs to know how often and under what conditions excess incremental stormflow volumes may be discharged for any proposed development.

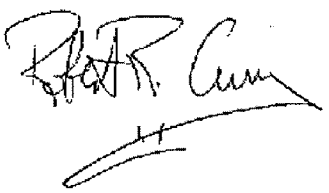
The point-source implications of storm-water management through continued reliance on the campus karst system raises many water quality concerns. The present playing fields in karst terrain are feeding nitrates and probably other contaminants to the off-campus spring systems such as the Pogonip springs and Kalkar Quarry. The

campus will have to develop considerable stormwater detention and treatment facilities if they intend to continue using the karst groundwater as a receiving system. Much of that system now comprises "known and definite channels" and as such is a protected water of the State and subject to non-degradation requirements. Although the BMPs in the SWMP call for "adequate filtration" and protection of drainageways that lead to swallow-holes and similar features, we are not told how this is to be accomplished, maintained, or monitored. Simple statements about an "effectiveness" criterion in the BMP do not insure that the BMP practice can actually be implemented.

Conclusions

The University of California Santa Cruz revised final SWMP for the main campus site is not yet adequate to insure further non-degradation of campus stormwater runoff. With an admitted projected increase in storm-flow volume that will be associated with future development of over 3 million square feet of new facilities and the associated roads, parking lots, and utility infrastructure, the SWMP should have demonstrated that new construction can result in zero increased discharge rather than a vague "low impact" or should have shown how the many existing high-impact erosive storm-flow scars and channels can be restored to mitigate future development to insure no net increase in storm-flow volume and sediment discharge.

Numeric standards and criteria are not yet sufficient. Roads and parking lot projects less than 5000 sq. ft. and buildings themselves need to have clear policy directives that limit runoff rate and volume increases or that set standards for offsite mitigation of onsite sediment and runoff impacts.



Robert R. Curry
Registered Geologist and Hydrologist
Calif. 3295

From: Don Stevens <don@bind.com>
To: Phillip Hammer <PHammer@waterboards.ca.gov>
CC: "Robert R. Curry" <curry@ucsc.edu>
Date: 1/5/2009 4:41 PM
Subject: UCSC SWMP Comments
Attachments: UCSC SWMP 1-5-09.doc; SC4FTA 1.DOC; SCSJ95 1.DOC; MonroeKarstOrdinance.pdf

Dear Phil,

Please find my attached UCSC SWMP comment letter and relevant attachments of previous Water Board letters and the Monroe County Karst Ordinance.

Thanks for all of your past cooperation.

Regards,
Don

January 5, 2009

Phil Hammer
Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 94301

Dear Phil,

Thank you for the opportunity to comment on the UC Santa Cruz Storm Water Management Plan (October 2008). I am submitting these comments to you on behalf of the Santa Cruz environmental group, Habitat And Watershed Caretakers. I would also like bring to your attention my several years of monitoring erosion problems at UCSC and previous interaction with members of the Water Board and staff. About 3 years ago, the then Chairman of the Water Board encouraged me to work with staff concerning the unique considerations of environmental protection for the karst system at UCSC.

I believe the UCSC SWMP has serious deficiencies and should not be adopted unless it is significantly revised to include greater specificity and measurable goals that can be clearly understood by the public. The fundamental goal should be to improve the overall health of existing watersheds and receiving waters, but it is likely that the four major watersheds on campus will be significantly degraded by increased erosion in the coming years because of massive UCSC development plans and a lack of specific and cumulative analysis and measurable and enforceable goals in the current plan.

UCSC presents an inaccurate narrative claiming excellent environmental stewardship over the decades when the opposite is the case for the most part. UCSC does not have a conventional storm water infrastructure system, its watersheds have experienced severe erosion, and UCSC has followed an unsound practice of directing large post-development, unfiltered, polluted storm water flows into the sinkholes of the karst system (see photos under separate cover), polluting its stored ground water. The major sinkholes have silted up over time and now lack adequate capacity for storm water conveyance, leading to still more erosion (see the 2004 Kennedy-Jenks study).

One glaring shortcoming of the SWMP is that UCSC has failed to provide any details about its 2005-2020 Long Range Development Plan (LRDP) that calls for over 3 million square feet of new development, including over 2 million square feet in the currently undeveloped upper campus with soils that are highly susceptible to erosion if disturbed (according to the Kennedy-Jenks study). UCSC failed to mention in the SWMP that Section 4.8.2.4 of the EIR (LRDP Impact HYD-3) for the 2005-2020 LRDP determined there would be significant and unavoidable erosion and degradation of the watersheds. This seems to me to be directly at odds with the purpose of the Phase II program.

For your reference and for the record, I would like to include a portion here of the December 19, 2005 Water Board comment letter to UCSC and include the entire letter as

an attachment to this document. The Water Board correctly pointed out serious problems at UCSC that were not resolved in the FEIR and are not addressed in the current SWMP.

"Stormwater Source Control

Water Board staff is concerned that existing and foreseeable future erosion and sedimentation issues are not being addressed at the source of the problem as development continues through the proposed expansion of the UCSC campus. UCSC has experienced extensive erosion and excessive sedimentation to its natural drainage system that is largely due to increased runoff from impervious surfaces. Future development will add more impervious surface to the UCSC campus, thus exacerbating the erosion and sediment problems. Water Board staff has concerns with regards to erosion, sedimentation, urban pollutants, and the lack of source stormwater controls. The following are some specific examples that validate these concerns:

1. *The Stormwater and Drainage Master Plan states, "On-going channel incision is so severe in many campus drainages that it is a significant consideration with regard to the use of natural drainage channels for stormwater conveyance, and limits future development options" (Kennedy/Jenks Consultants 2004).*

2. *Many of the campus sinkholes used for stormwater discharge conveyance are at capacity from increased sedimentation, resulting in downstream flooding, increased sediment, and urban pollutant loads to creeks and other water bodies.*

3. *The eastern portion of campus that drains to the San Lorenzo River Watershed is currently receiving concentrated stormwater runoff, contributing to deep incision, channel bank failure, and erosion to the San Lorenzo Watershed. This raises a particular concern since the San Lorenzo River is currently listed under the Clean Water Act 303(d) list for sediment impairment.*

4. *The Stormwater and Drainage Master Plan states, "Any future development to the North Campus area is prohibited due to heavy erosion from increase in surface runoff as a result of increased impervious area" (Kennedy/Jenks Consultants 2004). This area is described as having highly erosive soil that relies on natural infiltration to accommodate stormwater flow. However, the Draft EIR proposes an increase from 7 acres to 54 acres of impervious surface, resulting in a 31 percent increase in runoff.*

5. *Section 4.8.2.4 of the Draft EIR (LRDP Impact HYD-3) is determined significant yet unavoidable. This is not an acceptable determination under current conditions. These conditions only exist under conventional stormwater management design and therefore, can be resolved by implementing design standards that control stormwater at the source.*

As the University expands, the amount of impervious area that is projected to be added to the campus almost doubles. Along with this comes higher flow rates, greater volume, and increased urban pollutant levels. We feel that a preventative approach must be taken to address these issues so that extensive erosion and sedimentation do not persist.

Proposed stormwater drainage system improvements focus on channel alteration, detention, and diversion of stormwater flows. These improvements may help with existing erosion and sedimentation issues. However, they will not prevent the problem from reoccurring in the future. UCSC Campus Standards Handbook repeatedly states, "Storm drainage design shall provide for detention of stormwater runoff so that the post-development runoff rate does not exceed the pre-development runoff rate." The University is currently not meeting these pre-development runoff standards, resulting in extensive erosion to the campus natural drainage system. Subsequently, stormwater runoff detention addresses peak flow rates but does not address overall volume of stormwater flows. Increased volume still contributes to downstream erosion even when runoff is released at smaller amounts over longer periods of time. In addition, we are concerned that stormwater drainage system improvements may not be implemented before new buildings and other impervious surfaces are constructed, as stated in the Draft EIR section 4.8.2.4 page 33.

We highly suggest that the University takes a preventative approach to erosion control, sedimentation, and urban pollutants by controlling stormwater at the source. To accomplish this we suggest implementing Low Impact Development (LID) Design Standards to all new development and to existing development where feasible. LID captures stormwater at the source, allows stormwater to infiltrate, and prevents further water quality impacts (erosion, sedimentation, and urban pollutant loads) from occurring downstream."

For emphasis, please note that the Water Board stated in the above quoted letter: "Section 4.8.2.4 of the Draft EIR (LRDP Impact HYD-3) is determined significant yet unavoidable. This is not an acceptable determination under current conditions." (Impact HYD-3 is erosion and degradation of the watersheds). However, UCSC in fact adopted this determination in the Final EIR in spite of Water Board comments. In another letter dated January 6, 2006 and attached in full to this document, the Water Board stated: "A formal, campus-wide wetland delineation should be performed and incorporated into the 2005 LRDP EIR prior to specific development project proposals and before further evaluation of the 2005 LRDP DEIR." However, UCSC declined to conduct the campus-wide wetland delineation.

The Water Board now has the opportunity and obligation to require clear and definitive language in the UCSC SWMP to ensure that significant erosion and degradation of the watersheds will not result from new development. The SWMP should assure that new development will not add increased storm water rates, volumes, or durations from pre-development conditions. It should require that development plans be modified, if necessary, to conform to the specific goals of the SWMP. Alternatively, the SWMP

should contain the clear goals and specific requirements so that a determination by UCSC that is not acceptable to the Water Board as cited above will not occur.

There should also be specific recognition of the special considerations for the karst system and appropriate regulations and safeguards. Karst is far more vulnerable to pollution than streams or the ocean. In the case of spill contaminants, there is no way to clean up karst- you can't get to it. We do not know the residence times of water in the karst, whereas mixing and low residence times are more likely in streams and the ocean. Also, there is much less biological activity in the karst than in the ocean or streams/rivers and so the assimilative capacity of karst systems should be considered nil.

For example, there is a large drainage pipe that conveys storm water flows from the Science Hill area including a loading dock area, roads and parking lots that outlets directly into a sinkhole (see photos sent under separate cover). This is something that should not be allowed and should be addressed in the SWMP. There should be specific rules about development around sinkholes and a set of requirements for a regular monitoring system for storm water flows directed into sinkholes. For you reference, I will attach the Monroe County, Indiana Karst Ordinance, which is an example of the kinds of environmental protective measures that might be included in the SWMP.

In summary, the UCSC SWMP is inadequate in its current form. The 3.175 million square feet of new development proposed in the 2005-2020 Long Range Development Plan must be incorporated and analyzed for consistency with goals that include specific numeric requirements and benchmarks that protect water quality. The unique circumstance for the Central Coast Regional Board of the karst hydrogeology at UCSC should also be addressed.

Thank you very much for you attention. I particularly appreciate all the time you have taken in the past months to help me understand this process.

Sincerely,
Don Stevens
Habitat And Watershed Caretakers
320 Cave Gulch
Santa Cruz, CA 95060
Tel: 831-425-4721

Alan C. Lloyd, Ph.D.
Agency Secretary

California Regional Water Quality Control Board
Central Coast Region

Arnold Schwarzenegger
Governor

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December 19, 2005

John Barnes
Director of Campus Planning
University of California, Santa Cruz
Physical Planning and Construction
1156 High Street
Santa Cruz, CA 95064

COMMENTS – UC SANTA CRUZ 2005 LONG RANGE DEVELOPMENT PLAN DRAFT EIR, INFRASTRUCTURE IMPROVEMENT PROJECT, 2300 DELAWARE AV., FAMILY STUDENT HOUSING REDEVELOPMENT, SCH# 2005012113

Mr. Barnes:

Thank you for the opportunity to review and comment on the October, 2005 Draft Environmental Impact Report (EIR). We understand that the project is a land use plan that supports projected population growth and physical development of the UC Santa Cruz campus and offsite facilities over the next 15 years. It also evaluates the Infrastructure Improvement Project, 2300 Delaware Av. Project, and Family Student Housing Redevelopment Project, which will be tiered from the LRDP EIR.

As you may be aware, the Central Coast Regional Water Quality Control Board (Water Board) is a responsible agency charged with the protection of the Waters of the State of California in the Central Coast Region. Waters of the State include surface waters, ground waters, and wetlands. The Regional Board is responsible for administering regulations established by the Federal Clean Water Act and the California Water Code (Porter-Cologne Water Quality Control Act). The regulations cover discharges to surface water, groundwater, and discharges to land that may affect ground water quality, and may apply to this project.

We find the information provided in the Draft EIR to be inconsistent with the NPDES General Permit for construction activity and inadequate at addressing source control of stormwater runoff, which would ultimately affect water quality. **To facilitate the regulatory review process, we offer the following suggestions for your review.**

NPDES Construction General Permit

Section 4.8.2.4 (LRDP Impact HYD-2) states that construction on sites smaller than one acre are not subject to the requirement for construction-phase SWPPPs. This statement is inconsistent

with the General Permit. Construction activity that results in soil disturbance of less than one acre is subject to the NPDES General Permit regulations, including the SWPPP, if the construction activity is part of a larger common plan of development (UCSC LRDP) that encompasses one or more acres of soil disturbance (Fact sheet for Water Quality Order 99-08-DWQ, NPDES Construction General Permit). For further reference please see:

http://www.swrcb.ca.gov/stormwtr/docs/finalconstpermit.pdf

Stormwater Source Control

Water Board staff is concerned that existing and foreseeable future erosion and sedimentation issues are not being addressed at the source of the problem as development continues through the proposed expansion of the UCSC campus. UCSC has experienced extensive erosion and excessive sedimentation to its natural drainage system that is largely due to increased runoff from impervious surfaces. Future development will add more impervious surface to the UCSC campus, thus exacerbating the erosion and sediment problems. Water Board staff has concerns with regards to erosion, sedimentation, urban pollutants, and the lack of source stormwater controls. The following are some specific examples that validate these concerns:

1. The Stormwater and Drainage Master Plan states, "On-going channel incision is so severe in many campus drainages that it is a significant consideration with regard to the use of natural drainage channels for stormwater conveyance, and limits future development options" (Kennedy/Jenks Consultants 2004).

2. Many of the campus sinkholes used for stormwater discharge conveyance are at capacity from increased sedimentation, resulting in downstream flooding, increased sediment, and urban pollutant loads to creeks and other water bodies.

3. The eastern portion of campus that drains to the San Lorenzo River Watershed is currently receiving concentrated stormwater runoff, contributing to deep incision, channel bank failure, and erosion to the San Lorenzo Watershed. This raises a particular concern since the San Lorenzo River is currently listed under the Clean Water Act 303(d) list for sediment impairment.

4. The Stormwater and Drainage Master Plan states, "Any future development to the North Campus area is prohibited due to heavy erosion from increase in surface runoff as a result of increased impervious area" (Kennedy/Jenks Consultants 2004). This area is described as having highly erosive soil that relies on natural infiltration to accommodate stormwater flow. However, the Draft EIR proposes an increase from 7 acres to 54 acres of impervious surface, resulting in a 31 percent increase in runoff.

5. Section 4.8.2.4 of the Draft EIR (LRDP Impact HYD-3) is determined significant yet unavoidable. This is not an acceptable determination under current conditions. These conditions only exist under conventional stormwater management design and therefore, can be resolved by implementing design standards that control stormwater at the source.

As the University expands, the amount of impervious area that is projected to be added to the campus almost doubles. Along with this comes higher flow rates, greater volume, and increased urban pollutant levels. We feel that a preventative approach must be taken to address these issues so that extensive erosion and sedimentation do not persist.

Proposed stormwater drainage system improvements focus on channel alteration, detention, and diversion of stormwater flows. These improvements may help with existing erosion and sedimentation issues. However, they will not prevent the problem from reoccurring in the future. UCSC Campus Standards Handbook repeatedly states, "Storm drainage design shall provide for detention of stormwater runoff so that the post-development runoff rate does not exceed the pre-development runoff rate." The University is currently not meeting these pre-development runoff standards, resulting in extensive erosion to the campus natural drainage system. Subsequently, stormwater runoff detention addresses peak flow rates but does not address overall volume of stormwater flows. Increased volume still contributes to downstream erosion even when runoff is released at smaller amounts over longer periods of time. In addition, we are concerned that stormwater drainage system improvements may not be implemented before new buildings and other impervious surfaces are constructed, as stated in the Draft EIR section 4.8.2.4 page 33.

We highly suggest that the University takes a preventative approach to erosion control, sedimentation, and urban pollutants by controlling stormwater at the source. To accomplish this we suggest implementing Low Impact Development (LID) Design Standards to all new development and to existing development where feasible. LID captures stormwater at the source, allows stormwater to infiltrate, and prevents further water quality impacts (erosion, sedimentation, and urban pollutant loads) from occurring downstream.

Low Impact Development (LID)

LID is an alternative site design strategy that uses natural and engineered infiltration and storage techniques to control stormwater runoff where it is generated. LID combines conservation practices with distributed stormwater source controls and pollution prevention to maintain or restore watershed functions. The objective is to disperse LID devices uniformly across a site to minimize runoff (Anne Guillette, Whole Building Design Guide).

LID reintroduces the hydrologic and environmental functions that are altered with conventional stormwater management. LID helps to maintain the water balance on a site and reduces the detrimental effects that traditional end-of-pipe systems have on waterways and the groundwater supply. LID devices provide temporary retention areas; increase infiltration; allow for nutrient (pollutant) removal; and control the release of stormwater into adjacent waterways (Anne Guillette, Whole Building Design Guide). For further reference please see:

http://www.epa.gov/owow/nps/lid/

Ten Common LID Practices Include:

1. Site Design Layout to Reduce and Disconnect Impervious Surfaces
2. Rain Gardens and Bioretention

3. Rooftop Gardens
4. Tree Boxes to Capture and Infiltrate Street Runoff
5. Vegetated Swales, Buffers, and Strips; Native Vegetation Preservation
6. Roof Leader Flows Directed to Rain Gardens
7. Rain Barrels and Cisterns
8. Permeable Pavers
9. Soil Amendements
10. Pollution Prevention and Good Housekeeping

Water Quality Certification

The Water Board must certify that any permit issued by the Army Corps of Engineers per Section 404 of the Clean Water Act complies with state water quality standards, or deny certification. Section 401 Water Quality Certification is necessary for all Section 404 permits, including reporting and non-reporting Nationwide permits. Proponents of any project requiring a Section 404 permit from the Army Corps of Engineers should apply for Section 401 Water Quality Certification. Applications are available on-line at:

http://www.waterboards.ca.gov/centralcoast/401WQCert/Index.htm.

For Water Quality Certification, the Water Board requires that alternatives be considered for projects resulting in impacts on streams and wetlands. We also require mitigation of wetland impacts at a ratio of 3:1, mitigation of riparian impacts at a ratio of 1:1, and mitigation of streambed impacts at a ratio of 2:1 (through enhancement of riparian habitat).

Additionally, any project that involves disturbance of a streambank or riparian area must also obtain a Streambed Alteration Agreement from California Department of Fish and Game. *Evidence of CEQA compliance must be available before CWA Section 401 Water Quality Certification can be obtained.*

If you have questions regarding this matter, please contact Brandon Sanderson at (805) 549-3868, bsanderson@waterboards.ca.gov, or Donette Dunaway at (805) 549-3698, ddunaway@waterboards.ca.gov.

Sincerely,

Roger W. Briggs
Executive Officer

cc: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044

File: SCH 2005012113 - UCSC LRDP EIR Comment Letter 2005_12
S:\CEQA\CEQA Tracking\Santa Cruz County
Task: Storm Water EIR Review

Alan C. Lloyd, Ph.D.
Agency Secretary

California Regional Water Quality Control Board
Central Coast Region

Arnold Schwarzenegger
Governor

Internet Address: http://www.waterboards.ca.gov/centralcoast
895 Aerovista Place, Suite 101, San Luis Obispo, California 93401-7906
Phone (805) 549-3147 • FAX (805) 543-0397

January 6, 2006

John Barnes
Director of Campus Planning
University of California, Santa Cruz
Physical Planning and Construction
1156 High Street
Santa Cruz, CA 95064

SUPPLEMENTARY COMMENTS – UC SANTA CRUZ 2005 LONG RANGE DEVELOPMENT PLAN DRAFT EIR, INFRASTRUCTURE IMPROVEMENT PROJECT, 2300 DELAWARE AV., FAMILY STUDENT HOUSING REDEVELOPMENT, SCH# 2005012113

Mr. Barnes:

Upon further review, the Central Coast Regional Water Quality Control Board (Water Board) offers these additional comments to the comment letter dated December 19, 2005, for your review.

Wetland Delineation

It has been brought to the Water Boards attention that portions of the north campus, which are proposed for development under the 2005 LRDP DEIR, contain jurisdictional wetlands. Section 4.4.1.7 of the LRDP DEIR contains a brief discussion of wetland habitat at UCSC. However, Section 4.8 (Hydrology and Water Quality) of the DEIR makes no mention of wetland habitat or mitigation for potential loss of wetlands. As noted in the previous letter, the Water Board, under the CWA Section 401, must certify any permit issued by the Army Corps of Engineers per Section 404 of the CWA. Where the Army Corps determines they have no jurisdiction, the Water Board may issue Waste Discharge Requirements or conditional waivers of WDRs to address discharges to wetlands per the Porter Cologne Water Quality Act. A formal, campus-wide wetland delineation should be performed and incorporated into the 2005 LRDP EIR prior to specific development project proposals and before further evaluation of the 2005 LRDP DEIR. For additional information regarding section 401 Water Quality Certification, please contact Dominic Roques at (805) 542-4780, droques@waterboards.ca.gov.

Mitigation Funding

Water Board staff is concerned with UCSC's history of failure to comply with mitigation requirements due to "lack of funding." UCSC's 2004 Mitigation Monitoring Program Report repeatedly states that mitigation measures were not implemented due to "lack of funding" and "budget constraints." Such terms are unacceptable. Water Board staff

would like to reiterate that **mitigation funding is not to be budget dependent**. Funding for development mitigation design must be a priority and should receive adequate funding before project design begins. Water Board staff previously noted this concern in our comment letter to the Notice of Preparation for the 2005 LRDP dated February 25, 2005. However, the 2005 LRDP DEIR provides no assurance that mitigation funding will be a priority. Water Board staff does not want to see this problem repeated for the 2005 LRDP's prescribed mitigation. Water Board staff requires the 2005 LRDP EIR to address how UCSC will ensure that mitigation will be a priority and receive adequate funding.

If you have questions regarding this matter, please contact Brandon Sanderson at (805) 549-3868, bsanderson@waterboards.ca.gov, or Donette Dunaway at (805) 549-3698, ddunaway@waterboards.ca.gov.

Sincerely,

Roger W. Briggs
Executive Officer

cc: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044

File: SCH 2005012113 - UCSC LRDP DEIR Supplementary Comment Letter 2006_1
S:\CEQA\CEQA Tracking\Santa Cruz County
Task: Storm Water EIR Review

CHAPTER 829

ZONING ORDINANCE: KARST AND SINKHOLE DEVELOPMENT STANDARDS

829-1. Purpose and Intent

The purpose of this chapter is to establish review procedures, use limitations, design standards and performance standards applicable to site developments that encompass or affect sinkholes or other karst features. The intent of this chapter is to protect the public health, safety and welfare by requiring the development and use of environmentally constrained areas to proceed in a manner that promotes safe and appropriate storm water management and ground water quality.

829-2. Policy

Unless expressly stated otherwise or contrary to context, the provisions of this chapter shall be interpreted and applied in accordance with the following policies:

(A)Development in areas that encompass or affect sinkholes or other karst features (i.e., in "sinkhole areas") is prohibited unless expressly permitted by this chapter or until it is demonstrated that the development would have no significant detrimental impact on storm water management or ground water quality.

(B)Potential impacts on storm water management and ground water quality must be identified, assessed and addressed through written studies at the earliest stages of the development approval process (e.g., during the preliminary plat, development plan or site plan approval stages).

(C)The extent and sophistication of any required study should directly reflect the nature and complexity of the proposed development and of the development site (e.g., the more complex the karst features, the more extensive and sophisticated the study).

(D)All applicable Federal, State and Local permits shall be obtained prior to construction.

829-3. Development Requirements

(A) This chapter shall apply to all public, private and institutional land disturbing activities, with the following exception:

(1) Logging, mineral extraction, and agricultural uses.

(a)Accessory structures and roadways used for mineral extraction uses shall comply with the Ordinance if there is an anticipated impact on any adjacent property;

(b)Accessory structures and roadways used for logging and agricultural uses shall comply with the Ordinance; and,

(c)The above notwithstanding, the filling or plugging of a sinkhole with any material (e.g. earthen, manmade, animal or vegetable) in a way that adversely affects stormwater management or groundwater quality is prohibited.

(A)Any report, study, plan, calculation or proposal required by this chapter shall be provided by the petitioner at the petitioner's cost.

(C) Sinkhole conservancy areas (SCA) shall be established to the following minimum standards in all sinkhole areas subject to the sinkhole evaluation requirement of Section 829-4:

(1)For sinkholes less than or equal to one quarter (0.25) acre in area, the SCA shall, at a minimum, encompass the entire sinkhole and all of the area within twenty-five (25) feet of the sinkhole rim.

(2)For all sinkholes greater than one quarter (0.25) acre in size, the SCA shall, at a minimum, encompass all of the area within fifty (50) feet of the post-development sinkhole flooding area as determined in 829-6 or all of the area within twenty-five (25) feet of the sinkhole rim, whichever is less.

(3)For compound sinkholes, the SCA shall be established in accordance with parts (1) and (2) above for each component sinkhole and for the compound sinkhole. For example, if the compound sinkhole is greater than one quarter (0.25) acre in area, the SCA shall comply with part (2). The SCA for sinkholes that are less than one quarter (0.25) acre in area and that are within the compound sinkhole must comply with part (1). It is possible that areas within the rim of a compound sinkhole will not be subject to a SCA.

If a SCA is required to be established on a parcel that was not, or will not be created by recorded plat, a legal description of the SCA shall be included on the recorded deed of the parcel.

(A)Setbacks and Use Restrictions. The following setbacks and use restrictions are established.

(1) No new construction of any of the following shall be permitted within the SCA:

(a) Commercial or industrial structures;

(b) Private drives, streets, and highways unless the County Highway Engineer and Drainage Engineer conclude that traffic safety considerations outweigh stormwater and water quality considerations;

(c) Storage yards or parking lots for materials, vehicles and equipment;

(d) Residential structures and accessory structures;

(A)Public, semi-public and office facilities;

(B)Swimming pools and other amusement and recreational services unless expressly permitted; and/or

(C)Stormwater detention features that have not been approved by the drainage board.

(1)Construction of the following shall not be permitted within twenty-five (25) feet of the sinkhole rim regardless of size of sinkhole:

(a) structures for storage of hazardous material(s); and/or

(a)any structure associated with a use allowed in Light Industrial (LI) or Heavy Industrial (HI) zones.

(3) Residential, commercial, and industrial structures and public, semi-public and office facilities shall not be constructed within the sinkhole rim unless the lowest floor elevation is a minimum of five (5) feet above the sinkhole flooding elevation, or one (1) foot above the lowest elevation on the sinkhole rim, whichever is less, and provided that a statement of a registered professional engineer or geologist is submitted to the Administrator (see definitions Chapter 801) indicating that foundation conditions are suitable for such structures.

(4) Individual Wastewater Systems

(a) Septic tanks shall not be located within the SCA.

(b) Septic Disposal Fields or wastewater stabilization ponds (lagoons) shall not be located within twenty-five (25) feet of the SCA.

(5) Pesticides and fertilizers may be used in sinkhole areas only in accordance with the rules and regulations of the State of Indiana Pesticide Review Board and with industry standards.

(6) Operation of heavy construction equipment is prohibited in the SCA unless:

(a) it is demonstrated to the Administrator that the operation of such equipment is necessary to prevent clear and imminent danger to persons and property;

(a)the operation of such equipment is necessary to implement a drainage and/or erosion control plan approved by the Drainage Board; and/or

(a)if the operation of such equipment is required for the removal of material from a previously filled sinkhole.

(7) Underground utility lines, equipment and facilities shall be installed in a manner that does not disturb a sinkhole eye or disrupt the natural pattern of storm runoff into the sinkhole. Sanitary sewer lines installed within a SCA shall be water grade pipe.

(8) Recreational facilities such as unpaved hiking, jogging, and bicycling trails, playgrounds, and exercise courses, are permitted within the SCA.

(9) Golf courses and grass playing fields are permitted within the SCA subject to approval of a Management Plan for use of pesticides and fertilizers by the Administrator.

(10) Clearing and pruning of trees as well as understory, and limited grubbing of roots is permitted within the SCA provided that equivalent or improved protective living vegetative ground cover is maintained.

(11) Landscaping and minor gardening is permitted in the SCA provided erosion and sediment discharge is limited through use of minimum tillage and mulches. Normal yard and landscaping maintenance is permitted.

(12) Construction of light incidental landscaping and recreational structures (such as gazebos, playground equipment, etc.), is permitted in the SCA but not within the sinkhole eye. Such structures may not be placed within a SCA on excavated foundations or concrete pads but may be placed on small concrete post-hole foundations.

The above notwithstanding, no land disturbing activity may occur within a SCA if that development, construction or use is determined by the Administrator to violate the intent of this chapter.

(E) Newly formed or pre-existing sinkholes that become active in a way that causes an immediate threat to nearby structures, roadways, persons, and/or property may be stabilized and filled provided existing drainage patterns are not changed. This subsection authorizes conditional, emergency action to remediate a hazardous condition. However, within thirty (30) days of the action, the person responsible for taking the action shall submit a report to the Administrator detailing the actions used to stabilize and/or fill the sinkhole. The report shall be reviewed by the County Drainage Engineer and County Surveyor to determine whether existing drainage patterns were changed by the action. If the Engineer and Surveyor find that existing drainage patterns were changed, the person responsible for the action shall promptly take all measures necessary to restore the drainage patterns and to otherwise comply with this Chapter.

(F) Stormwater Detention in Sinkholes. The Administrator, upon the Drainage Board's recommendation, may waive detention requirements to allow increased runoff into sinkholes and may authorize excavation within a sinkhole flooding area in order to provide additional water detention storage, upon finding that:

(1)the flooding concerns expressed through Section 829-6 will be satisfactorily addressed;

(2)there are no other areas on the site suitable for detention; and

(3)there will be no significant impact on the karst system or upon water quality.

In cases where concentrated runoff is directed to sinkholes, temporary and permanent erosion control measures, as detailed in a plan approved by the Administrator shall be implemented to prevent channel erosion.

(G) Modification of Sinkholes to Increase Outflow Rates. Increasing outflow rates of sinkholes by excavating the sinkhole eye or installing disposal wells for diverting surface runoff to the groundwater system is prohibited, unless:

(1)it is demonstrated to the satisfaction of the Administrator and/or the Drainage Engineer that such an action is necessary to safeguard persons or property from clear and imminent danger; or

(2)such an action is required to implement a drainage and/or erosion control plan that was approved by the Administrator.

(H) Altered Sinkholes. Filling or altering of sinkholes without an improvement location permit constitutes a zoning violation. In the event, corrective measures must be taken. No corrective or remedial measures shall be undertaken until a remediation plan has been approved by all relevant County entities or representatives and the Administrator has issued an improvement location permit for the plan. No building permits will be issued, or zoning or subdivision approvals granted until the remedial measures specified in the improvement location permit have been completed and approved.

(I)Airport Evaluation. With respect to all land owned, used and/or held by the Monroe County Board of Aviation Commissioners (BAC) for airport purposes, a Section 829-4 sinkhole evaluation (Airport Evaluation) may be made for the entire property (Airport Property). If made for the entire Airport Property, the Airport Evaluation shall be submitted to the Administrator, the Monroe County Drainage Board and the Monroe County Plan Commission for their review. Upon a finding of compliance with this chapter and with other relevant County Code chapters, the foregoing entities shall approve the Airport Evaluation.

(a)All future development, construction and land disturbing activities (Development Activities) at the Airport Property shall be:

(a)Consistent with the approved Airport Evaluation;

(b)Remedial actions suggested by the Airport Evaluation and required as a part of the Airport Evaluation approval may be implemented at one time or may be implemented in phases in conjunction with future Development Activities; and,

(c)For each proposed Development Activity, BAC shall seek site plan approval and, in connection with that process, shall submit for review and approval that portion of the Airport Evaluation relevant to the proposed Development Activities.

(b)The original Airport Evaluation shall remain in full force and effect for a period of five (5) years from the date it is approved by the County Planning Commission. During that period of time, Development Activities at the Airport Property are subject to the approved terms and provisions of the Airport Evaluation and to the zoning and drainage regulations in effect on the date the Airport Evaluation was approved.

(c)The Airport Evaluation shall be re-evaluated after a five (5) year period.

(a)The BAC may apply for additional five (5) year extensions without limitation;

(b)Each request for a re-evaluation of the Airport Evaluation shall be reviewed by the Administrator and may be approved administratively, subject to compliance with current law; and,

(c)If the Administrator finds that further extension of the Airport Evaluation is not possible under the Federal, State or County Code regulations in effect at the time of review, the BAC shall be promptly notified and shall be given a period or one (1) year beyond the expiration of the current five (5) year period to bring the Airport Evaluation into compliance with the relevant regulations.

(2)The Airport Evaluation shall be consistent with the Federal and State authorities with respect to Airport Property development requirements.

(1)Federal and State standards and requirements will supersede local standards in the event of a conflict or discrepancy; and

(2)In the event that Federal and/or State standards change during the period Airport Evaluation approval, activities may continue in accordance with such changes until the end of the period for which the Airport Evaluation was approved.

829-4. **Sinkhole Evaluation and Plan Requirements**

A Sinkhole Evaluation shall be performed for each site subject to this chapter (i.e., sites upon which sinkholes are fully or partially located and/or which drain to sinkholes). A Sinkhole Evaluation shall include the information set forth in subsections A through F of this section.

The following types of developments or sites may be excepted from full compliance with the Sinkhole Evaluation requirements upon the petitioner's request and a finding by the Administrator that significant drainage or water quality impacts will not result from the development or the use of the site:

(1)administrative and minor subdivisions;
(1)lots created greater than 10 acres for agricultural and residential uses; and
(2)existing lots of record for which single-family residential use is proposed.

The above notwithstanding, neither the Administrator nor the Drainage Board may except a development or a site from subsection 829-4 (E). The burden of proof for establishing that there will be no significant impacts shall rest with the petitioner.

(A) A plat or site plan for the proposed subdivision or development, setting forth the following information for each of the enumerated items:

(1) Sinkholes

(a) Location and limits of the area of the sinkhole depression as determined by field surveys or other reliable sources as may be approved by the Administrator. Location of sinkholes based solely upon USGS 7 ½ Minute Series Quadrangle Maps will not be considered sufficient unless field verified by a registered Indiana Surveyor, Engineer, or geologist.

(b) Location and elevation of the sinkhole eye or low point.

(c) Topographic contours at maximum intervals of two (2) feet, and spot elevations sufficient to determine the low point on the sinkhole rim and the profile of the potential overflow areas.

(d) Minimum floor elevations of any existing structures located within the sinkhole rim.

(e) Elevation of any public or private roadway or drive located within or adjacent to the sinkhole.

(2) Flooding limits as determined in Section 829-6.

(3) Water considerations specified in Section 829-7, including, without limitation:

(a) The approximate location of public or private water supply sources such as springs or wells within 500 feet of the site.

(b) Boundaries of any known recharge areas to wells or springs.

(4) Other geologic features: location of caves, springs, faults and fracture trends, geologic mapping units.

(5) Proposed discharge points: the location, type and size of all points at which concentrated discharges of stormwater into the sinkhole are proposed. The drainage area to each point of concentrated discharge shall be delineated on the plan and the size of the drainage area noted.

(6) Existing watercourses which drain into the sinkhole.

(1)All other information required to demonstrate or assess compliance with this chapter, as specified by the Administrator.

(2)The location of the foregoing items with respect to the location of the proposed or existing roads, detention ponds, significant landscaping features, property lines, underground utilities, and other structures.

(B) A drainage area map showing the sinkhole watershed area, and where the site is located in a sinkhole cluster area. This map shall be extended to include, in the watershed area, any sinkholes located downstream of the site.

(A)Proposed SCA in accordance with Chapter 829-3 (C).

(D) An analysis of the orientation and flow of the sinkhole drainage system, as detailed on the subsection (B) map. The use of dye trace injection testing to produce an accurate mapping of the system may be required by the Administrator when the system drains towards an area that has known flooding problems and for which the flow pattern has not been established through previous dye testing, and when significant increases or decreases in the runoff to sinkholes is expected to result from the proposed development. Significant increases generally occur if the residential density is greater than one lot per two acres (or a commercial development with equivalent impervious surfaces).

(E) The approximate location of karst features must be shown on the final plat based on the best available mapping and/or noted on the deeds if no plat is recorded for the subdivision.

(A)All other information deemed necessary by the Administrator.

829-5. **Permit Requirement**

No person or persons shall engage in the grading of land or modification of a sinkhole within the SCA or the area that would be covered by a SCA as described in 829-3 (C) without first securing an improvement location permit from the Administrator .

(l)The owner of the property or person having an interest therein shall submit an application for a permit to the Administrator along with the sinkhole evaluation required by 829-4. The Administrator shall submit all applications to the County Drainage Engineer for review and comment and may, upon the Drainage Engineer's recommendation, submit an application to the Drainage Board for review and comment.

(B) Upon review of the information presented by the applicant, the site, and other information as may be available, the Administrator may issue a permit for work to be performed in the SCA.

(1)All work shall be performed in accordance with the requirements of the Zoning Ordinance and any conditions of permit approval; and,
(2)The Administrator may designate certain areas where grading or construction equipment is not permitted or is otherwise limited.

(C) Karst-Related Non-Buildable Areas. In addition to establishing a plan for grading and use of construction equipment, the Administrator may, based upon the topography, geology, soils, history of the sinkhole (such as past filling) and the developer's engineer's storm water analysis and plan, establish sinkhole-related non-buildable areas:

(1)No buildings, parking areas, grading or other structures shall be permitted within the sinkhole-related non-buildable area unless otherwise authorized by the Administrator; and

(2)No private drives, streets, and highways shall be permitted within the sinkhole-related non-buildable area unless the County Highway Engineer and Drainage Engineer conclude that traffic safety considerations outweigh stormwater and water quality considerations.

829-6. **Flooding Considerations**

(A) Sinkhole Flooding Area. Except in cases in which the annual exceedance probability (AEP) of 1% (100 year storm) has been determined in a published flood insurance study, the sinkhole flooding area shall be determined for each sinkhole for both pre-development and post-development conditions, assuming no subsurface outflow from the sinkhole.

Where the estimated volume of runoff exceeds the volume of the sinkhole depression, the depth, spread and path of overflow shall be estimated using methods established by the Drainage Board and shown on the plan.

The overflow volume shall be included in determining the maximum estimated flooding elevations in the next downstream sinkhole. This analysis shall continue downstream until the lowest sinkhole of the sinkhole cluster is reached or overflow reaches a surface watercourse.

The volume of runoff considered shall be that which results from a rainstorm with a 1% AEP and a duration of forty-eight (48) hours. The runoff volume shall be determined by the method set forth in the Natural Resource Conservation Service's TR-55 Manual.

No further flooding analysis will be required provided that:

(1) The post-development flooding area of any sinkhole which receives drainage from the site is located entirely on the site.

(2) A drainage easement covering the post-development flooding area is provided for any off-site sinkhole or portion of a sinkhole which receives increased peak rates of runoff from the site. If the receiving sinkhole is not contiguous to the site, an easement must also be provided for the waterway which connects the site to the sinkhole.

(3) The minimum floor elevation of any existing structure is at least two (2) feet higher than the estimated flooding elevation from the 1% AEP 48-hour storm.

(4) The increase in volume of runoff from the site does not cause the flooding depth on any existing public road to exceed the maximum depth as determined by the Drainage Board.

(B) Detailed Flooding Analysis. In cases where the conditions set forth in (A) above cannot be met, a detailed flooding analysis will be required if any increase in runoff volume is proposed or expected. As part of the detailed flooding analysis, a runoff model must be made and a reservoir routing analysis performed for the sinkhole watershed using hydrograph techniques as established by the Drainage Board.

(C) The following alternative methods may be proposed and approved, singly or in combination, to keep flooding levels at pre-development levels:

(1) Diversion of Excess Runoff to Surface Watercourses. Where feasible, increased post-development runoff may be diverted to a surface watercourse, provided that

(a) Any increase in peak runoff rate in the receiving watercourse does not create or worsen existing flooding problems downstream; and

(b) The diverted storm water remains in the same surface watershed.

Storm sewers, open channels and other appurtenances provided for diversions shall be designed in accordance with applicable sections of these Design Criteria.

The effect of diverted water on downstream watercourses and developments, and requirements for additional detention facilities prior to release of runoff to the surface watercourse shall be determined as established by the Drainage Board.

(2) Storage of Excess Runoff within the Sinkhole Watershed. If consistent with the intent of this chapter, detention facilities may be constructed within the sinkhole watershed or the area of the sinkhole outside of the sinkhole flooding area as determined for post-development conditions.

(A)The flooding considerations set forth in this section are designed and are intended to ensure that:

(A)Inflow rates to the sinkhole are maintained at or below pre-development values; and

(B)Sediment and erosion control and water quality considerations set forth in this chapter can be satisfied.

829-7. Water Quality Considerations

Because sinkholes provide direct recharge routes to groundwater, water quality in wells, caves, and springs may be affected by discharge of runoff from developed sinkhole areas. Consequently, and as more fully specified in subsections A through D below, the Sinkhole Evaluation must address potential impacts of proposed development on receiving groundwaters and must propose water quality management measures to mitigate such impacts.

(A) Receiving Groundwater Use. The Sinkhole Evaluation Report shall identify whether the site lies within a critical area or a sensitive area based upon the following classifications.

(1) Critical Areas. The following areas are classified as critically sensitive to contamination from runoff and thus, are critical areas for purposes of this chapter:

(a) Areas within 100 feet of private water supply wells.

(b) Areas within 300 feet of public water supply wells.

(c) Areas within 500 feet of springs used for public or private water supply.

(d) Areas within 1000 feet of caves providing habitat to rare or endangered species.

The distances listed above may be extended by the Administrator where the recharge areas for a well, spring, or cave have been determined by studies by a qualified engineer or geologist. The length of the extension may be no greater than necessary to achieve the policies of this chapter.

(2) Sensitive Areas. Sinkhole areas that are not within critical areas are classified as sensitive for groundwater contamination for purposes of this chapter.

(B) Groundwater Contamination Hazard. The relative potential for groundwater contamination shall be classified as low, moderate, or high depending upon the nature of the proposed land use, development density and amount of directly connected impervious area. The Sinkhole Evaluation shall identify whether the proposed development poses a low, moderate, or high hazard to groundwater uses, as defined below:

(1) Low Hazard. The following land uses are classified as posing a relatively low hazard to groundwater contamination:

(a) Residential developments on sewer, provided directly connected impervious areas discharging to the sinkhole are less than or equal to one (1) acre in total area;

(b) Parks and recreation areas;

(c) Low density commercial and office developments, provided directly connected impervious areas discharging to the sinkhole are less than or equal to one (1) acre in total area; and

(d) Discharge from graded areas less than or equal to one (1) acre.

(2) Moderate Hazard. The following land uses are classified as posing a relatively moderate hazard to groundwater contamination:

(a) Concentrated discharge from streets, parking lots, roofs, and other directly connected impervious areas having an area greater than one (1) acre and less than or equal to five (5) acres;

(b) Multifamily residential developments and higher intensity office developments, provided the directly connected impervious areas discharging to the sinkhole are less than or equal to five (5) acres; and

(c) Discharge from graded areas greater than one (1) acre and less than or equal to five (5) acres.

(3) High Hazard. The following land uses are classified as posing a high hazard to groundwater contamination:

(a) Collector and arterial streets and highways;

(b) Railroads;

(c) Concentrated discharge from streets, parking lots, roofs, and other directly connected impervious areas having an area greater than five (5) acres;

(d) Commercial, industrial, and manufacturing areas;

(e) Individual wastewater treatment systems;

(f) Commercial feed lots or poultry operations; and

(g) Discharge from graded areas greater than five (5) acres.

(C) Water Quality Management Measures. The majority of sinkholes drain a limited watershed area. For sinkholes where the surrounding drainage area is small enough that the area draining to the sinkhole flows predominantly as sheet flow, potential impacts on water quality can be addressed in many cases by erecting and maintaining reliable silt control barriers around the sinkhole during construction and providing a vegetative buffer area around the sinkhole to filter out potential contaminants.

When the volume of runoff into the sinkhole increases to the point where flow becomes concentrated surface flow, the degree of effort required to capture and filter out contaminants increases significantly.

Concentrated surface flow occurs naturally when the sinkhole watershed area reaches a sufficient size for watercourses leading into the sinkhole to form. Concentrated surface flow results as urbanization occurs due to construction of roads, storm sewers, and drainage channels. Subsurface flows can become concentrated through utility trenches.

(D) Mitigation of Stormwater Runoff. The following water quality management measures may be used to mitigate the impact of storm water runoff quality. Temporary sediment controls are required for all sites. The other measures listed may be used singly or in combination as needed based upon the potential groundwater contamination hazard of the proposed development.

(1) Sediment and Erosion Control

(a) Nonconcentrated (sheet) flow: existing ground cover shall not be removed within twenty-five (25) feet of the sinkhole flooding area and a temporary silt barrier shall be erected and maintained around the outer perimeter of the buffer area during the construction period. Vegetative cover must be of sufficient quality and density to provide desired filtration. If existing vegetative cover is sparse, it must be improved to sufficient quality and density to provide the desired filtration.

(b) Concentrated surface and subsurface flow: a sediment basin will be required at each point where concentrated flows are discharged into the sinkhole. Sediment basins shall be designed according to criteria set forth in the *Indiana Handbook for Erosion Control in Developing Areas*. A permanent sediment basin may be required by the Drainage Board in some cases. This requirement shall be based on the watershed area, the disturbance that the proposed project will create, and the availability of suitable sites for a sediment basin.

(2) Minimizing Directly Connected Impervious Area.

(a)The groundwater contamination hazard category for impervious areas may be reduced by reducing the amount of directly connected impervious area. This is the area of roofs, drives, streets, parking lots, etc., which are connected via paved gutters, channels, or storm sewers.

(b)Directly connected impervious areas can be reduced by providing sized grass swales, vegetative filter strips or other Best Management Practices to separate paved areas.

(3) Diversion of Runoff.

(a)Concentrated discharges to sinkholes can be reduced to manageable levels or avoided by diverting runoff from impervious areas away from sinkholes where possible.

(b)Diversions shall be done in a manner that does not increase flooding hazards on downstream properties and, generally, shall not be directed out of the surface watershed in which the sinkhole is located.

(4) Filtration Areas. For areas having a low groundwater contamination hazard and where flow into the sinkhole occurs as sheet flow, water quality requirements can be satisfied by maintaining a permanent vegetative buffer area with a minimum width of twenty-five (25) feet around the sinkhole flooding area.

(5) Grassed Swales and Channels.

(a)For areas having a low groundwater contamination hazard, concentrated flows from directly connected impervious areas of less than one (1) acre may be discharged into the sinkhole through grassed swales and channels.

(b)Swales and channels shall be designed for non-erosive velocities and appropriate temporary erosion control measures such as sodding or erosion control blankets shall be provided.

(6) Storage and Infiltration. Storage and infiltration basins shall be designed to capture the first one-half (0.5) of an inch of runoff from the tributary drainage area and release the runoff over a minimum period of twenty-four (24) hours. Standard outlet structures for sedimentation and infiltration are shown in the *Indiana Handbook for Erosion Control in Developing Areas*. Storage and infiltration will be required in the following cases:

(a) All areas having a high groundwater contamination hazard.

(b) Areas having a moderate groundwater contamination hazard and where concentrated inflow occurs.

(7) Hazardous and Toxic Materials. Facilities which involve storage or handling of hazardous or toxic materials shall comply with the State of Indiana Department of Environmental Management.

[end of chapter]

From: Don Stevens <don@bind.com>
To: Phillip Hammer <PHammer@waterboards.ca.gov>
CC: "Robert R. Curry" <curry@ucsc.edu>
Date: 1/6/2009 9:03 AM
Subject: UCSC SWMP Photos
Attachments: End of Pipe into Sink Hole[2].JPG; Pipe into Sink Hole[2].JPG

Hi Phil,

Please include or attach these photos referenced in my comment letter. The photos were taken on October 22, 2008 in the early afternoon.

Thanks,
Don

Photos submitted by Don Stevens Jan. 6, 2009 as part of comments on UCSC SWMP

From: <coastalprairie@aol.com>
To: <PHammer@waterboards.ca.gov>
CC: <curry@ucsc.edu>, <don@bind.com>
Date: 1/5/2009 5:01 PM
Subject: Re: UCSC SWMP Comments

Hello Phil,

I would like to submit just a couple of pointed comments on the UCSC SWMP.

Your agency may be largely unfamiliar with karst formations as these are rare in your jurisdiction.? Please note several unique features of karst which should be of special concern to you as you weigh UCSC's SWMP.

1)? karst geology allows direct access to groundwater, presenting important complications for clean water

2) once a pollutant is discharged into karst, clean up is more difficult than pollutants discharged into surface waters.? Pollutants entering streams, rivers, or the ocean can be accessed.? Once pollutants enter karst, one must employ methods used for cleaning and monitoring groundwater, which can be much more difficult, expensive, etc.?

3) assimilative capacity of karst can be much less than surface waters because biological activity is much less than in rivers, streams, and the ocean.? Therefore, standards for clean water need to be held higher.

4) the karst system under UCSC has many endemic species that could be sensitive to water quality.? These species should be considered rare and endangered, though they are currently not listed.? These aquatic systems, then, should be of special concern to your agency.

I urge you and your agency to consider discharge into karst differently than the surface waters you generally regulate.? These systems deserve special levels of protection.

UCSC currently discharges directly into sinkholes in at least 4 locations.

Thanks,

Grey Hayes, PhD
Davenport, CA

>>> "kbusby@calpoly.edu" <kbusby@calpoly.edu> 1/7/2009 11:41 AM >>>
Generator Microsoft Word 11 (filtered medium)

Dear Dominic,

With regards to the UCSC Storm Water Management Plan (SWMP), my primary comment is that UCSC is not a Traditional MS4 and should not be subject to the requirements of Traditional MS4s and the February 15th letter. The distinction is important as the EPA and most states have demonstrated by providing language that is less onerous than the permit language for the traditional MS4. The distinction is primarily due to the significant operational/structural differences as well as the institutions ability to raise revenue. Universities (UC, CSU and Community Colleges) in particular may have difficulty complying with restrictive standards.

While staff may have determined that UCSC, UCSB and Vandenberg AFB should have requirements according to the February 15th letter, it is premature to require this of NTMS4s until the new Phase II permit has been issued. Please provide the documentation that staff used to make the determination that UCSC, UCSB and Vandenberg AFB should be included in the current enrollment strategy (as indicted in the Dec 2007 enrollment strategy).

I have been working with SWRCB through CASQA on the development of the new Phase II permit. As you are aware, discussions of the new permit include providing separate or revised permitting language for the NonTraditional MS4s (NTMS4s). During this process, I have provided several examples including Washington state permits where NTMS4s are asked to comply with different standards than traditional MS4s to meet MEP and the Phase II requirements. Why is Region 3 recreating and complicating issues that other regulatory agencies (including other regions) have already analyzed?

Thank you for your consideration. Please forward my comments to current board members. Have a great day.

Kim Busby, CPSWQ
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