

## MEMORANDUM

DATE: July 20, 2004  
TO: Marcel Uzegbu  
COMPANY: City of Oakland Public Works Agency  
FROM: Rick Ziegler  
Christie Beeman  
Jeff Haltiner  
COPY TO:  
RE: Conditions of Approval specific to hydrology  
PWA Ref. #: 1674



This memorandum addresses project Conditions of Approval (COA) related to hydrologic issues associated with the proposed Leona Quarry development (PWA Project # 1674) and as requested by the City of Oakland Public Works Agency. PWA has reviewed Balance Hydrologics' (BH's) hydraulic model and associated report dated March 11, 2004, and provides these comments as a follow-up to our previous memorandum (dated March 25, 2004). Our comments regarding the COA are based on the following:

- Balance Hydrologics Inc, *Summary of Supplemental Hydrologic and Hydraulic Modeling for the Leona Quarry Project*, March 11, 2004 (updated Fig. 487 received April 14, 2004).
- Balance Hydrologics Inc, MOUSE model files provided electronically on April 8, 2004
- CBG, *Leona Quarry Rough Grading Plan*, March 2, 2004.
- BCA, *Leona Quarry Project Structures*, March 23, 2004.
- City of Oakland Public Works Agency, *Hydrology requirement/Checklist COA 23, MMRP D 6a, D.6b, F.1a, 1b, F2.a, F2b, F.3a, F4a, F4b, F5a*, March 19, 2004.
- City of Oakland, *Exhibit C - Conditions of Approval for Leona Quarry Project Vesting Tentative Map, Planned Unit Development Approval and Design Review - City Council Resolution*, February 17, 2004.

### SCOPE OF PWA REVIEW

The conclusions presented in the BH report are based on numerical modeling performed by BH using MOUSE (software application developed by DHI Water & Environment for modeling urban hydrology and hydraulics). PWA reviewed BH's MOUSE model to verify model input parameters and model results

as they relate to hydrology-related COA for the project. PWA performed a targeted review to assess whether the model meets the following requirements:

- 1) Hydrologic (rainfall/runoff) elements of the model are consistent with previous modeling performed in HEC-1.
- 2) Hydraulic modeling assumptions, parameter selection and model setup are reasonable, and consistent with standard practice.
- 3) Modeling results are consistent with reported results (BH 03/11/04).
- 4) Detention basin stage-storage relationship modeled in MOUSE is consistent with the configuration shown on the 3/2/04 CBG plans.
- 5) Detention basin outlet riser configuration (orifice dimensions and flow line) modeled in MOUSE is consistent with the 3/23/04 BCA plans.

The BH report (Figure 3 received 04/14/04, and Figure 4 dated 03/11/04) shows schematic layouts of the pipe networks modeled in MOUSE under existing and post-project conditions. Tables 1 and 2 (attached) provide details on the pipe network geometry as modeled by BH (April 8, 2004). PWA did not verify model data describing the geometry of pipes ("links") or junctions ("nodes") as part of this review. Please note that the reported MOUSE model results may not be valid if the data shown on Table 1 are not consistent with existing conditions, or if construction of new pipes and junctions is not consistent with the corresponding data in Table 2.

### RESULTS OF PWA REVIEW

PWA's review concludes that the BH model meets requirements 1) through 5) described above. The project design and hydrologic/hydraulic modeling described in BH's March 11, 2004 report are consistent with previous PWA recommendations and hydrology-related COA. MOUSE model results indicate that the proposed detention basin will reduce flood hazard downstream of the site by reducing peak flow rates and flood volumes as compared to existing conditions. In addition, the results indicate that the detention basin design has adequate capacity to regulate flows from the project site such that peak flows from upstream of I-580 will not exceed the functional capacity of the 39-inch culvert under the freeway for the 24-hour design storms modeled.

#### *1) F.1a, Proposed detention basin:*

According to MOUSE modeling results, the proposed detention basin is designed to regulate flows from the project site such that peak flows during a 24-hour, 25-year design storm are at or below pre-project levels. Model results indicate that the proposed detention basin has sufficient capacity to maintain 2.5 feet of freeboard above the 100-year peak water surface elevation, assuming the basin performs as designed.

#### *2) F.1a, Grading and site drainage plans:*

- a) Based on MOUSE modeling results, proposed project site grading and drainage plans meet the following criteria from the COA:

- Post-project runoff from the site during a 25-year, 24-hour design storm will not exceed the capacity of the existing 39-inch pipe under I-580; and
- Post-project runoff from the site during a 25-year, 24-hour design storm will not result in flooding outside the storm drain system upstream of I-580. The model of post-project conditions assumes that the existing manhole 2227140 will be sealed such that it does not allow overflow. Model results show that the hydraulic grade line (HGL) reaches a peak of 0.7 feet above the ground surface at manhole 2227140 during the 25-year, 24-hour design storm (2.6 feet for the 100-year, 24-hour design storm), but overflow is not predicted due to the sealed condition. If the manhole were not sealed, model results suggest some overflow may occur.

- b) According to our review, BH's MOUSE model (April 8, 2004) conforms with the COA and reflects standard modeling practice with respect to initial modeled water levels in proposed and existing detention basins.

**3) F.1a, Detention capacity:**

According to the H/H report (BH, March 11, 2004) and the Rough Grading Plan (CBG, March 2, 2004), the active storage capacity of the proposed detention basin is approximately 25 acre-feet (this value does not include the lowermost 3 ac-ft of water quality volume or the uppermost 2.5 feet of freeboard). The proposed detention basin is larger than the one previously reviewed (15.6 ac-ft) in the SEIR and meets the Alameda County criteria as described above, based on H/H modeling results.

**4) Alternate F.1b, Ridgmont detention basin (Pond 4):**

Proposed changes to the Ridgmont pond (Pond 4) include the following (according to conceptual design Figures 5 and 6 of BH's report, dated March 2004):

- a) The existing 30-inch outlet pipe will be replaced by a 42-inch outlet pipe.
- b) The existing outlet structure will be replaced with a single six-foot circular drop inlet drainage structure.

Due to the proposed changes to the Ridgmont pond, the pond's storage volume is not factored into the MOUSE model of post-project conditions, unlike BH's original HEC-1 post-project hydrology model. This indicates that the project applicant has chosen Alternate Mitigation Measure F.1b, and has altered the design of the Ridgmont pond to minimize detention capabilities of the existing pond. PWA did not receive or review a detailed analysis of the proposed Ridgmont pond outlet works (for example, stage-storage-outflow relationships).

## RECOMMENDATIONS

As a result of the review described in this memorandum, PWA recommends the City of Oakland include the following elements in the continuing hydrologic/hydraulic review of the Leona Quarry project.

- 1) Check node and link geometry from the MOUSE model of existing conditions to verify that the model is consistent with the City's understanding of the existing storm drain system, especially for the trunk line along Mountain Boulevard and under I-580.
- 2) Review the assumption that the existing manhole 2227140 will be sealed under post-project conditions considering the HGL is predicted by the MOUSE model to be above the ground surface for the 25-year, 24-hour storm. (Note: manholes 2227109 and 8000101 are also modeled as sealed in the post-project conditions, but the model results do not indicate HGLs above the ground surface at these nodes )
- 3) Verify that the final design plans for the detention basin and related inlets and outlets agree with orifice dimensions, flow lines, and other pertinent parameters included in the MOUSE model. (Our review verified that the orifice dimensions and elevation shown for main outlet riser on BCA 3/23/04 matched what was in the MOUSE model. However, BCA 3/23/04 did not include orifice dimensions or flow line for the water quality outlet riser.)
- 4) After the review is complete, require the project proponent to submit an updated, final report on the hydrologic and hydraulic analysis that contains sufficient information to allow future reviewers to verify the analyses.

Table 1.

Stormdrain network data  
 MOUSE model, Existing Conditions  
 from Balance Hydrologics 4/8/04  
 PWA 4/15/04

notes: dimensions and elevations are in feet  
 top type: 1 = normal, 2 = sealed, 3 = spilling  
 outlet shape: 2 = sharp, 7 = effective flow area  
 link length calculated from node coordinates, unless specified

Node Identification	Diameter	Invert Elev.	Ground Elev.	Outlet Shape	Top Type
NODE = '2227142'	4	263.9	275.09	2	3
NODE = '2227116'	4	273.7	295.9	2	1
NODE = 'BH3'	4	275	297	7	2
NODE = '2227109'	4	284.8	297.7	2	3
NODE = '8000101'	4	287.75	300	2	3
NODE = '2227140'	4	289.4	297.9	2	3
NODE = '2227151'	4	310.6	317.1	2	3
NODE = '2227157'	6	258.9	269	2	1
NODE = '2226188'	6	255.9	262.1	2	1
NODE = '2226179'	6	244.4	253.7	2	1
NODE = 'BH4'	6	242.32	251.6	7	1
NODE = '2226165'	6	239.3	246.2	2	1
NODE = '2226160'	4	237.16	243	2	1
NODE = 'ELQ inlet'	5	295	299	2	3
NODE = 'Sunnymere 1'	4	269.5	276.6	2	1
NODE = 'Sunnymere 2'	4	270.6	277.8	2	1
NODE = 'Sunnymere 3'	4	271.9	279.9	2	1
NODE = 'Burckhalter 1'	4	265.09	276.8	2	1
NODE = 'Burckhalter 2'	4	267.21	277	2	1
NODE = 'Burckhalter 3'	4	272	283	2	1
NODE = 'Mountain 1'	4	322.5	329.5	2	3
NODE = 'Mountain 2'	4	328.4	334.2	2	3
NODE = 'Delmont 1'	4	240	246	2	1
NODE = 'I-580 1'	4	278.5	291	2	1
NODE = 'I-580 2'	3	295	300	2	3
NODE = 'I-580 3'	3	313.3	317.8	2	3
NODE = 'LQC Inlet'	5	293.4	298.5	2	3
NODE = 'WLQ Inlet'	5	296	300	2	3

Link Identification	From Node	To Node	Diameter	Manning's n	Length
LINK = 'BH3'	'BH3'	'2227116'	4	0.015	50
LINK = '30478'	'2227109'	'BH3'	3.25	0.015	264
LINK = '8000101'	'8000101'	'2227109'	3.25	0.015	457
LINK = '2227140'	'2227140'	'8000101'	3.25	0.015	175
LINK = '2227151'	'2227151'	'2227140'	2.5	0.015	311
LINK = '22271421'	'2227142'	'2227157'	4	0.015	
LINK = '22271571'	'2227157'	'2226188'	4.25	0.015	270
LINK = '22261881'	'2226188'	'2226179'	4.25	0.015	347
LINK = 'BH41'	'BH4'	'2226165'	4.25	0.015	
LINK = '22261651'	'2226165'	'2226160'	4.5	0.015	
LINK = '2226179'	'2226179'	'BH4'	4.25	0.015	
LINK = 'ELQ inlet'	'ELQ inlet'	'2227140'	3	0.015	
LINK = 'Sunnymere 1'	'Sunnymere 1'	'2227142'	2	0.015	
LINK = 'Sunnymere 2'	'Sunnymere 2'	'Sunnymere 1'	2	0.015	
LINK = 'Sunnymere 3'	'Sunnymere 3'	'Sunnymere 2'	2	0.015	
LINK = 'Burckhalter 1'	'Burckhalter 1'	'2227157'	2	0.015	
LINK = 'Burckhalter 2'	'Burckhalter 2'	'Burckhalter 1'	2	0.015	155.5
LINK = 'Burckhalter 3'	'Burckhalter 3'	'Burckhalter 2'	2	0.015	27.54
LINK = 'Mountain 1'	'Mountain 1'	'2227151'	2.5	0.015	153.7
LINK = 'Mountain 2'	'Mountain 2'	'Mountain 1'	2.5	0.015	
LINK = 'Delmont 1'	'Delmont 1'	'2226165'	1.5	0.015	
LINK = 'I-580 1'	'I-580 1'	'2227116'	2	0.015	
LINK = '71167142'	'2227116'	'2227142'	4	0.015	
LINK = 'I-580 2'	'I-580 2'	'2227109'	1.5	0.015	
LINK = 'I-580 3'	'I-580 3'	'2227151'	1.5	0.015	
LINK = 'LQC Inlet'	'LQC Inlet'	'8000101'	2.5	0.015	
LINK = 'WLQ Inlet'	'WLQ Inlet'	'2227109'	2.5	0.015	



Table 2.

Stormdrain network data  
 MOUSE model, Post-project conditions  
 from Balance Hydrologics 4/8/04  
 PWA 4/15/04

notes: dimensions and elevations are in feet  
 top type: 1 = normal, 2 = sealed, 3 = spilling  
 outlet shape: 2 = sharp, 7 = effective flow area  
 link length calculated from node coordinates, unless specified

Node Identification	Diameter	Invert Elev.	Ground Elev.	Outlet Shape	Top Type
NODE = '2227142'	4	263.9	275.09	2	3
NODE = '2227116'	4	273.7	295.9	2	1
NODE = 'BH3'	4	275	297	7	2
NODE = '2227109'	10	284.8	300	2	2
NODE = '8000101'	4	287.8	300.1	2	2
NODE = '2227140'	4	289.4	297.9	2	2
NODE = '2227151'	4	310.6	317.1	2	3
NODE = 'PostCB3'	3	290.9	296.9	2	3
NODE = 'PostCB5'	3	291.9	296.62	2	3
NODE = '2227157'	6	258.9	269	2	1
NODE = '2226188'	6	255.9	262.1	2	1
NODE = '2226179'	6	244.4	253.7	2	1
NODE = 'BH4'	6	242.3	251.6	7	1
NODE = '2226165'	6	239.3	246.2	2	1
NODE = '2226160'	4	237.2	243	2	1
NODE = 'Detention Basin'	1	289	318.5	2	1
NODE = 'SDMH 6'	4	301.9	306.5	2	2
NODE = 'FI 1'	4	302.2	306	2	3
NODE = 'Sunnymere 1'	4	269.5	276.6	2	1
NODE = 'Sunnymere 2'	4	270.6	277.8	2	1
NODE = 'Sunnymere 3'	4	271.9	279.4	2	1
NODE = 'Burckhalter 1'	4	265.1	276.8	2	1
NODE = 'Burckhalter 2'	4	267.2	277	2	1
NODE = 'Burckhalter 3'	4	272	283	2	1
NODE = 'Mountain 1'	4	322.5	329.5	2	3
NODE = 'Mountain 2'	4	328.4	334.2	2	3
NODE = 'Delmont 1'	4	240	246	2	1
NODE = 'I-580 1'	4	278.5	291	2	1
NODE = 'I-580 2'	3	295	300	2	3
NODE = 'I-580 3'	3	313.3	317.8	2	3
NODE = 'Outlet MH4'	4	285.9	306	7	1
NODE = 'Outlet MH2'	4	286.2	301	2	2
NODE = 'SDMH3'	3	290.2	300.2	2	3
NODE = 'Outlet MH1'	4	287.9	295	2	2
NODE = 'PostCB4'	3	291.4	299.04	2	3
NODE = 'PostCB7'	3	290.4	295.63	2	3

Link Identification	From Node	To Node	Diameter	Manning's n	Length
LINK = 'BH3'	'BH3'	'2227116'	4	0.015	50
LINK = '30478'	'2227109'	'BH3'	3.25	0.015	264
LINK = '222714211'	'2227142'	'2227157'	4	0.015	270
LINK = '222715711'	'2227157'	'2226188'	4.25	0.015	347
LINK = '222618811'	'2226188'	'2226179'	4.25	0.015	130
LINK = 'BH411'	'BH4'	'2226165'	4.5	0.015	143
LINK = '222616511'	'2226165'	'2226160'	4.25	0.015	32
LINK = '2226179'	'2226179'	'BH4'	3	0.015	175
LINK = 'SDMH 611'	'SDMH 6'	'2227140'	3	0.015	143
LINK = 'Stub11'	'FI 1'	'SDMH 6'	2	0.015	32
LINK = '2227140'	'2227140'	'8000101'	3.25	0.015	175
LINK = 'Sunnymere 1'	'Sunnymere 1'	'2227142'	2	0.015	
LINK = 'Sunnymere 2'	'Sunnymere 2'	'Sunnymere 1'	2	0.015	
LINK = 'Sunnymere 3'	'Sunnymere 3'	'Sunnymere 2'	2	0.015	
LINK = 'Burckhalter 1'	'Burckhalter 1'	'2227157'	2	0.015	155.54
LINK = 'Burckhalter 2'	'Burckhalter 2'	'Burckhalter 1'	2	0.015	27.538
LINK = 'Burckhalter 3'	'Burckhalter 3'	'Burckhalter 2'	2	0.015	153.69
LINK = 'Mountain 1'	'Mountain 1'	'2227151'	2.5	0.015	
LINK = 'Mountain 2'	'Mountain 2'	'Mountain 1'	2.5	0.015	
LINK = 'Delmont 1'	'Delmont 1'	'2226165'	1.5	0.015	
LINK = 'Simulation Link'	'Detention Basin'	'Outlet MH2'	1	0.015	30
LINK = 'Moutain A'	'2227151'	'SDMH 6'	2.5	0.015	
LINK = 'I-580 1'	'I-580 1'	'2227116'	2	0.015	
LINK = '71167142'	'2227116'	'2227142'	4	0.015	
LINK = 'I-580 2'	'I-580 2'	'2227109'	1.5	0.015	
LINK = 'I-580 3'	'I-580 3'	'2227151'	1.5	0.015	
LINK = '01017109'	'8000101'	'2227109'	3.25	0.015	457
LINK = 'PostCB711'	'PostCB7'	'8000101'	1.5	0.015	
LINK = 'PostCB511'	'PostCB5'	'PostCB4'	1.5	0.015	
LINK = 'Outlet 4'	'Outlet MH4'	'2227109'	6	0.015	110
LINK = 'PostCB411'	'PostCB4'	'PostCB3'	1.5	0.015	
LINK = 'Outlet 1'	'Outlet MH1'	'Outlet MH2'	1.5	0.015	13
LINK = 'PostCB311'	'PostCB3'	'SDMH3'	2	0.015	
LINK = 'Outlet 2'	'Outlet MH2'	'2227109'	3.5	0.015	
LINK = 'SDMH311'	'SDMH3'	'8000101'	2	0.015	

Orifice Identification	From Node	To Node	Width	Height	Invert Elev.	Max Elev.	Min Elev.
ORIFICE = 'Orifice 1'	'Detention Basin'	'Outlet MH2'	2.05	2	297.7	300	286
ORIFICE = 'WQ Orifice'	'Detention Basin'	'Outlet MH1'	0.38	0.25	289.1	315.5	292

