Targeted General Plan Amendment – Zoning Ordinance Update (TGPA-ZOU)
Draft Environmental Impact Report (EIR)
Individual Public Comments received during the 120-day public review period of March 24, 2014 through July 23, 2014. Comment period was closed on July 23, 2014.

# Assigned	Name	Email	Date Received	Method	Date entered in DB
250964	Tom Infusino	tomi@volcano.net	03/25/14	Email	05/20/14
250977	Ellen Van Dyke	vandyke.5@sbcglobal.net	03/31/14	Email	05/20/14
250980	Rob & Gloria Vernon	rgvernon@directcon.net	04/01/14	Email	05/20/14
250982	William and Jo Ann Hoffman	bill.hoffman@hughes.net	04/02/14	Email	05/20/14
250983	Geoffry Wilson	gwilson@d-web.com	04/02/14	Email	05/20/14
250984	Sean McGinness	seanmcginness@gmail.com	04/23/14	Email	05/20/14
260989	Joyce Bennett		4/28/14	Hard Copy	5/20/14
260990	Thomas R. Van Noord, Attorney at Law		4/30/14	Hard Copy	5/20/14
280967	Rob & Gloria Vernon	rgvernon@directcon.net	04/01/14	Web Form	05/20/14
280968	Lawrence and Jane Alexander	Lawrie@Britcars.com	04/09/14	Web Form	05/20/14
280969	Bill Draper	cbdrapers@gmail.com	04/13/14	Web Form	05/20/14
280970	Richard Boylan	drboylan@outlook.com	04/16/14	Web Form	05/20/14
280971	Jim Copeland	jimcope@comcast.net	04/17/14	Web Form	05/20/14
280972	Jake Lee	jake.gloria@yahoo.com	04/18/14	Web Form	05/20/14

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# Assigned	Name	Email	Date Received	Method	Date entered in DB
280973	Diane Lehr	djdoxie@comcast.net	04/18/14	Web Form	05/20/14
280974	Aaron Klinger	aklinger@mindspring.com	04/19/14	Web Form	05/20/14
280975	Scott Keeling	skeeling51@gmail.com	04/14/14	Web Form	05/20/14
280976	Katie Huff	katiejane.huff@gmail.com	04/27/14	Web Form	05/20/14
250994	Chuck Beckwith	beckwith@gmail.com	07/01/14	Email	07/08/14
250995	Kathy McCoy	kathy@mccoypartners.com	07/01/14	Email	07/08/14
250996	Pam Sheil	design@auburnlaketrails.org	07/07/14	Email	07/08/14
250997	Gregory Rezak	yourfamilytrust@aol.com	07/07/14	Email	07/08/14
260991	Larry T. Ring		06/13/14	Hard Copy	07/08/14
251003	Gregory Rezak	yourfamilytrust@aol.com	7/17/14	Email	7/25/14
251004	Kathy McCoy	kathy@mccoypartners.com	7/1/14	Email	7/25/14
251005	Charlene Hensley	hensleycharlene@gmail.com	7/21/14	Email	7/25/14
251006	Cheryl Langley	Cheryl.langley@cdpr.ca.gov	7/21/14	Email	7/25/14
251007	Cedric Twight	CTwight@spi-ind.com	7/21/14	Email	7/25/14

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# Assigned	Name	Email	Date Received	Method	Date entered in DB
251008	Kim Hatch	Khatch1900@yahoo.com	7/21/14	Email	7/25/14
251009	Jill Larner	jalarner@comcast.net	7/21/14	Email	7/25/14
251010	Karen Warner	dvinones@aol.com	7/21/14	Email	7/25/14
251011	Ellen Katz	ek4575@att.net	7/22/14	Email	7/25/14
251012	Ellen Obradovic	ellenobradovic@gmail.com	7/22/14	Email	7/25/14
251013	Julie Mack	juliemack@yahoo.com	7/22/14	Email	7/25/14
251014	Dave Hammond	daveh@skylinevaquero.com	7/22/14	Email	7/25/14
251015	Richard & Connie Cashdollar	cmcrmc@gmail.com	7/22/14	Email	7/25/14
261017	Kathleen M. Prevost	None	7/22/14	Hardcopy	7/25/14
251016	Shelley Wiley	None	7/22/14	Email	7/25/14
251018	David Pava	David@Pava.com	7/22/14	Email	7/25/14
251019	Mr. & Mrs. Michael Mueller	mikemue2@comcast.net	7/22/14	Email	7/25/14
251020	Jennie Zraick	Jgerm64@yahoo.com	7/22/14	Email	7/25/14

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# Assigned	Name	Email	Date Received	Method	Date entered in DB
251021	Ashley Blinn	ashleyblinn@yahoo.com	7/22/14	Email	7/25/14
251022	Larry Patterson	larry@pattersondev.com	7/22/14	Email	7/25/14
251023	Steve Cogburn	roostercogburn99@gmail.com	7/22/14	Email	7/25/14
251024	Steve Clark	Jsclark58@gmail.com	7/22/14	Email	7/25/14
251025	Carole Browne	carolebrowne@sbcglobal.net	7/22/14	Email	7/25/14
251026	Theresa & Dana Davis	wildrose903@verizon.net	7/22/14	Email	7/25/14
251027	Mickey Sizemore	sizemore@hughes.net	7/22/14	Email	7/25/14
251028	Ed Mattson	Emattson95682@gmail.com	7/23/14	Email	7/25/14
251029	Lindell Price *Req. attachment via email - CJ	lindellprice@gmail.com	7/23/14	Email	7/25/14
251030	Stanley Price	2stanleyprice@gmail.com	7/23/14	Email	7/25/14
251031	Karen Mulvany	kmulvany@gmail.com	7/23/14	Email	7/25/14
251032	Karen Mulvany	kmulvany@gmail.com	7/23/14	Email	7/25/14
251033	Karen Mulvany	kmulvany@gmail.com	7/23/14	Email	7/25/14

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# Assigned	Name	Email	Date Received	Method	Date entered in DB
251034	Karen Mulvany	kmulvany@gmail.com	7/23/14	Email	7/25/14
251035	Stanley Price	2stanleyprice@gmail.com	7/23/14	Email	7/25/14
251036	Stanley Price	2stanleyprice@gmail.com	7/23/14	Email	7/25/14
251037	Francesca Duchamp	francescaduchamp@att.net	7/23/14	Email	7/25/14
251038	Stanley Stailey	ststailey@sbcglobal.net	7/23/14	Email	7/25/14
281040	Sue Taylor	Sue-taylor@comcast.net	7/23/14	Web Form	7/25/14
281041	Shelley Wiley	swiley@directcon.net	7/23/14	Web Form	7/25/14
281042	Teddy McGraw	tnbmcgraw@msn.com	7/24/14	Web Form	7/25/14
251050	Dejan Obradovic	dejan@adriaticbuilders.com	7/22/14	Email	7/28/14

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# Assigned	Name	Email	Date Received	Method	Date entered in DB
251060	Joel Ellinwood – Lawyer - Planner	Jellinwood49@gmail.com	7/24/14	Email	7/28/14
251068	Rob & Gloria Vernon	robandglovernon@gmail.com	8/4/14	Email	8/5/14

250964

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

What is the comment period for the TPGA/ZOU DEIR?

2 messages

Tom Infusino <tomi@volcano.net> Tue, Mar 25, 2014 at 10:54 AM
To: TGPA-ZOU@edcgov.us

Ms. Shawna Purvines, Long Range Planning

El Dorado County Community Development Agency

2850 Fairlane Court, Building C

Placerville, CA 95667

Hi,

On page ES-18, the DEIR states:

"ES.6 How to Comment on this Draft EIR

This is the Draft EIR for the TGPA/ZOU project. It will be available for public review and comment

for the 60-day period beginning March 24, 2014 and ending July 23, 2014."

In one place this sentence indicates that the comment period will be 60-days. In another place this sentence indicates that the comment period will be from March 24 to July 23; which is 120 days. What is the length of the comment period; 60 days or 120 days. What is the final date for submitting comments.

Please reply by email as soon as possible, so that I may provide you with timely comments.

Sincerely,

Tom Infusino

(209) 295-8866

250964

TGPA-ZOU ZOU <tgpa-zou@edcgov.us> Sat, May 17, 2014 at 5:27 AM
To: Tom Infusino <tomi@volcano.net>
Cc: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

Hi Tom,

Sorry for the confusion. The Board of Supervisors extended the comment period from the anticipated 60 days to 120 days. The final day to send comments on the TGPA-ZOU EIR is July 23, 2014.

Thank you,
Shawna Purvines
[Quoted text hidden]

250977

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Fw: dEIR layout question

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Apr 1, 2014 at 9:06 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **David Defanti** <david.defanti@edcgov.us>
Date: Tue, Apr 1, 2014 at 9:01 AM
Subject: Re: Fw: dEIR layout question
To: Ellen Van Dyke <vandyke.5@sbcglobal.net>, Shawna Purvines <shawna.purvines@edcgov.us>

The DEIR released last week is approximately 1,200 pages - about 400 pages in Chapters 1-7 and the remaining in Appendices A-D. I find that the Executive Summary is a good place to start - particularly the table summarizing project impacts, each impacts' level of significance, mitigation measures and level of significance after mitigation. The detailed impact analysis is in Chapter 3. I did a quick word search for the 30% slope issue and found discussion in nearly every section of Chapter 3 as well as in other chapters. Please let me know if I can answer any other questions or provide additional assistance.

-Dave

On Tue, Apr 1, 2014 at 6:06 AM, Ellen Van Dyke <vandyke.5@sbcglobal.net> wrote:

> Hello David-
>
> Shawna referred me to you for the question below. I believe what I am looking at is the complete dEIR (Chapters ES thru 7 and Appendices A-D), but wish to confirm that there are no other back up documents I might be missing that contain further analysis. Impact analysis appears to be under Chapter 3, and I think that's it. (yes I am using the search tool on an e-copy as Shawna wondered)
>
> Just checking, and thank you- Ellen
>
> **From:** Shawna Purvines
> **Sent:** Monday, March 31, 2014 4:31 PM
> **To:** Ellen Van Dyke
> **Subject:** Re: dEIR layout question
>
> Hi Ellen,
>
> Any given proposed revision/amendment may have various environmental impacts that would be addressed in the different sections of Chapter 3. If it was me and I was looking for something particular in the DEIR like a certain policy or phrase I usually do a search of the document so that I can see were it has been discussed throughout the document.
>
> I am out of the office until Thursday. If my suggestion above doesn't make sense, feel free to give David a call or I can contact you on Thursday.

250977

Shawna

On Mon, Mar 31, 2014 at 3:59 PM, Ellen Van Dyke <vandyke.5@sbcglobal.net> wrote:

> Hello Shawna-
>
> Need your help with how the dEIR document is laid out, I think.
>
> If I wish to find the impact analysis of a particular policy change, I would look somewhere in Chapter 3, Impact Analysis. For example, policy 7.1.2.1 regarding development on slopes over 30% is on page 3.8-5.
>
> Have I got it, or is there any place else I should be looking? I have the draft EIR, Executive Summary through Chapter 7, and Appendices A-D.
>
> Ellen

--

Shawna L. Purvines
Community Development Agency, Long Range Planning
County of El Dorado
2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362
Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

--

Dave Defanti, Assistant Director
Community Development Agency
County of El Dorado
2850 Fairlane Court
Placerville, CA 95667
Direct: (530) 621-5342
Fax: (530) 642-0508
david.defanti@edcgov.us
www.edcgov.us

250977

--

Shawna L. Purvines
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shawna.purvines@edcgov.us
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If you receive this e-mail in error please contact the sender by return e-mail and delete the material from your system.
Thank you.

250980

Cindy Johnson <cynthia.johnson@edcgov.us>

Re: LRP Web Pages Feedback Received - Submitted via TGPA-ZOU Online Comment Form

2 messages

Anne Novotny <anne.novotny@edcgov.us> Tue, Apr 1, 2014 at 12:01 PM
To: Larry Kinnings <larry.kinnings@edcgov.us>, Derek Reddin <derek.reddin@edcgov.us>
Cc: Cindy Johnson <cindy.johnson@edcgov.us>, Jean Warner <jean.warner@edcgov.us>

Larry & Derek,

I submitted this comment today via the TGPA-ZOU Online Comment Form.

--Anne

On Mon, Mar 31, 2014 at 7:44 AM, <rgvernon@directcon.net> wrote:

> Data from form "LRP Web Page Feedback" was received on 3/31/2014 7:44:23 AM.
>
> Long Range Planning (LRP) Web Page Feedback

Field	Value
Name	Rob & Gloria Vernon
Email	rgvernon@directcon.net
Phone	530-621-2468
Comments	We would like to voice our support for the proposed changes to the County ordinance "Off-road Vehicle Use" per Section 17.40.210 E. We have a problem in this neighborhood that this change would help address. Namely, a guy who has a moto-cross track in his "backyard" and who invites all his buddies to come play. The noise and dust is is irritating to say the least, and impacts the whole neighborhood. And his attitude is "F*** 'em!" I don't think that this kind of activity and attitude is in keeping with the community, where the rest of us just want to enjoy our properties in peace. This ordinance change would help in addressing these kinds of issues. Rob & Gloria Vernon Thompson Hill Rd.

> Email "LRP Web Pages Feedback Received" originally sent to anne.novotny@edcgov.us; cindy.johnson@edcgov.us; jean.warner@edcgov.us from rgvernon@directcon.net on 3/31/2014 7:44:23 AM. The following were also sent a copy: derek.reddin@edcgov.us.

250980

Thank you.

Cindy Johnson <cynthia.johnson@edcgov.us> Tue, Apr 1, 2014 at 2:51 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

Cindy Johnson
Administrative Technician
Community Development Agency, Long Range Planning
County of El Dorado
2850 Fairlane Court
Placerville, CA 95667
Direct: (530) 621-4650
Fax: (530) 642-0508
cynthia.johnson@edcgov.us
[Quoted text hidden]

250982

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Targeted General Plan Amendment & Zoning Ordinance Update (TGPA-ZOU)

1 message

William Hoffman <bill.hoffman@hughes.net> Wed, Apr 2, 2014 at 1:26 PM
To: TGPA-ZOU@edcgov.us
Cc: brenda.bailey@edcgov.us

Subject: New language in the County Zoning Ordinance Update 14.40.210E

Harvey Winje Motorcycle Dust, Noise & Annoyance

We are William and Jo Ann Hoffman who live at 5750 Thompson Hill Road, Placerville, CA, Parcel Number 089-030-15-100, and are retirees who are home most each and every day. We are the immediate neighbors of Harvey Winje who lives at 776 Cold Springs Road. We share the fence line with the part of his property that contains his motocross track and therefore receive the most noise and dust of any in the neighborhood when motorcyclists race around his track. We have lived here for over twenty-eight years and have tolerated the annoying and disruptive racing next door for over a decade. To date we have not filed complaints due to the unfriendly nature of his relationship with us since we purchased our property from him in 1986.

The excessive motorcycle noise and dust has been going on for the past decade or more since his father passed away and he took over the property. For years now there has been motorcycle racing on many days of each month and recently pretty much each day of the week. It is my understanding that he has grandsons and great grandsons who are involved with racing at a Sacramento motorcycle park and they "practice" at Harvey's track, the one directly across the fence from us. This usually occurs from mid-afternoon until early evening on weekdays and most weekend days, weather permitting. This has been going on for months now. During January with no rain the dust was especially bad just like summer days. One day in particular, Sunday January 19th the wind direction brought the dust directly onto our home. Our garage is only a few feet from the fence separating us from the racing activities and our house is just 20 feet beyond the garage. At the height of the racing we could barely see the garage from our house. We also had company that weekend from Tracy and they had just detailed their new truck and when they left on Sunday afternoon you could write your name anywhere on their vehicle including their windows. They had to turn the window washers on to see to drive home. That was the final straw for us after all these years. We had had similar situations over the past decades but never did call any authorities but did call Mr. Winje to complain. Sometimes to no avail. In past years many people would come on the weekend to race on the track and at one time we counted eleven cyclists of all ages from little ones to adults. Often it was so noisy that we would just leave our home for the day and come home late in the evening. The next day was often "interesting" when I would use our leaf blower to dust off our driveway creating an impressive dust cloud. This past year he cleared a firebreak around the front part of his property and then they started riding the motorcycles around it now exposing the front of our home to the dust and noise as well as to two other immediate neighbors who eventually complained to him heightening the awareness of his disturbing activities. Also, we are often subjected to parties and groups of riders visiting Mr. Winje's property on the weekends and we must endure hours of noise and clouds of dust caused by these parties. For instance last Sunday, March 2nd we observed two pickups entering Mr. Winje's property each with several motorcycles in them. We later videotaped numerous riders using Mr. Winje's track creating a great deal of noise.

250982

On several occasions over the years other neighbors would call the sheriff and Mr. Winje would confront me in person or by phone accusing me of calling the authorities which I had not but it just goes to show that he knows that he is creating an annoying and disturbing situation for us but seems not to care. He keeps saying his property is zoned agricultural and that he can do whatever he wants. On one occasion, a few years ago, my brother-in-law and his family came over during a summer weekend to enjoy our pool while we were away. He called the sheriff to complain about the motorcycles and they sent deputy to speak with Mr. Winje. During the deputy's talk with Mr. Winje she called my brother-in-law to give him the results and Mr. Winje yelled, "tell him to go f--k himself!" So you can see the personality we deal with here. I have asked my brother-in-law to also send you a message so you know that is not just hearsay. Mr. Winje now is 71 years old and was raised on the property and said he has been riding motorcycles for 60 years. I explained that since he was young the community has changes dramatically with many more people that are now exposed to his noise and dust and that he should be aware of how he is affecting his neighbors.

We have a swimming pool that we cannot enjoy during the summertime practice sessions, as to be outside at that time is "miserable". Clouds of dust and the loud roar of these engines is intolerable. Before we can swim in our pool again, we must first vacuum out a great deal of dust and dirt. Not only is there dust in our pool, but dust is covering our pool deck, our house deck, our road, our house roof and our garage roof and our cars which we keep in the garage. We cannot leave our house windows open any longer, nor can we use our screen doors. We cannot turn on our all-house fan, as we then suck all this dirt and dust into our home. We have planted 10-12 high Oleander plants along our fence line hopefully help capture a lot of this dust and the noise, but when you get even two motor cycles roaring around this track, there is no stopping the noise and the dust. During the hot summer months, we are very concerned about the fire danger that these cycles create.

We feel these Motor-Cross practice sessions and parties are creating a public nuisance and are greatly changing the character of our neighborhood and depriving those of us who live by Mr. Winje the right to the peaceful enjoyment of our respective properties.

We ask for your help to eliminate this problem.

Sincerely,

William and Jo Ann Hoffman

5750 Thompson Hill Road

Placerville, CA

Ph 530-626-6828

250983

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

TGPA-ZOU Ordinance 14.40.21 OE Harvey Winje Motorcycle dirt track, noise and DUST!

1 message

gwilson@d-web.com <gwilson@d-web.com> Wed, Apr 2, 2014 at 3:58 PM
To: TGPA-ZOU@edcgov.us, Bill Hoffman <bill.hoffman@hughes.net>, Jo Hoffman <jo.hoffman@hughes.net>

My name is Geoffrey Wilson and I live at 5661 Vineyard Lane, Placerville, California, next door to the Gold Hill Winery. I am writing to you about the excessive motorcycle noise originating from Harvey Winje's motorcycle track at 776 Cold Springs Road. For years now, myself, my family and many other neighbors living in this area have listened to the incessant roar of these motorcycles circling the track that Mr. Winje has built on his property.

A few years ago, me and my family visited the home of William and Jo Ann Hoffman at 5750 Thompson Hill Road. Jo Ann is my sister. My family came to enjoy their pool while they were away on vacation. The motorcycle noise and the clouds of dust caused by this motorcycle track made it impossible for us to enjoy our visit to their pool, so I called the sheriff to complain. Soon a deputy arrived to speak with Mr. Winje. Shortly thereafter, the deputy called me to discuss the results of her meeting with Mr. Winje, who proceeded to yell so loudly that I could hear him over her phone "Tell him to go f---k himself!". It is obvious that Mr. Winje does not care that his noise and dust is negatively affecting those who live around him.

Although I do not live right night door to Mr. Winje, the noise travels easily to my home…day after day, weekend after weekend, year after year. Many times I look toward my sister's home and all I can see is a huge cloud of dust settling over her place. She and her husband shouldn't have to live with such noise and dust. I feel these motorcycles and this track is a nuisance to all of us who live near Mr. Winje. Furthermore, it is depriving all of us the right to go outside and enjoy our property and the peaceful serenity we expect when we live in the country.

Please help us to eliminate this problem. This NEEDS TO STOP!!

Sincerely,

Geoffrey Wilson

5661 Vineyard Lane, PO Box 497

Coloma, CA 95613

Ph. 530-344-8118

250984

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Re: question regarding commercial zoning

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Wed, Apr 23, 2014 at 9:30 AM
To: Sean Mcginness <seanmcginness@gmail.com>, TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

Hi Sean,

The commercial zoning in and around the Candlelight Village was approved with the application of mobile home park many years ago. The 2004 General Plan retained the commercial land use in this area and therefore the Zoning Ordinance, required by State law to be consistent with the General Plan, retains the commercial zoning as well. There is a General Plan overlay on the mobile home park and adjacent commercial parcels limiting the creation of any new commercial parcels or mobile home parks outside of the existing area. It was the intent of the General Plan to reduce any further expanse of higher density residential and commercial development into rural areas.

Please give me a call if you have additional questions or wish to discuss this in more detail.

Shawna Purvines - 621-5362

On Tue, Apr 22, 2014 at 5:10 PM, Sean Mcginness <seanmcginness@gmail.com> wrote:

> Hi Shawna,
>
> We live at 7130 Buzzards Gulch Rd, Somerset, CA. Our parcel is adjacent to Candlelight Village. The proposed zoning map shows several acres of proposed Commercial zoning within and around Candlelight Village. That does not seem like an appropriate zoning for a rural area adjacent to planned ag.
>
> I am I misunderstanding something?
>
> Thank you,
>
> Sean McGinness
> (530) 903-1541

--

Shawna L. Purvines
Community Development Agency, Long Range Planning
County of El Dorado
2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362
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shawna.purvines@edcgov.us
www.edcgov.us

250984

Community Development Agency.

I just spent 3 hrs reading your long range plan.
who or what is EDH-TPAG & NOP?

Issue Policy 5.2.1.3 NOP response. I do not believe the foothills have a water table.

Why on earth would it be against the law to slaughter animals you raise for your food? Animal rights activists?

Why would you limit what could be sold at a ranch, orchard etc to what is grown there?

Why are crafts that generate business being discouraged?

Why would you build on slopes that fire trucks have trouble getting up?

Why are heavily populated areas getting special treatment in voicing their concerns and a special road fund?

At home businesses should be encouraged.

We have wonderful horse trails. Stables, rides ect should be exploited.

Is your aim to consolidate areas + lead to incorporation?

In Greenwood we pay a fee for solid waste but there is no plant that I know of on the Ridge. We could make much better use of that money for fire protection.

You don't need a acre for 4-H sheep or rabbits.

Where in the Co. do you have solid or waste water facilities? Is the whole Co. paying to support them?

After 3 hrs of reading this is what I come up with.

Sincerely

Joya Bennett
2601 Syd Rd
Greenwood
Ca

260990

THOMAS R. VAN NOORD
Attorney at Law
3350 Country Club Drive, #202
Cameron Park, CA 95682
(530) 677-1025 FAX (530) 677-6580

April 30, 2014

Shawna Purvines
Development Services Department
El Dorado County
2850 Fairlane Court
Placerville, CA 95667

Re: Request/recommendation to amend the draft ZOU Main Street zone to allow micro-distilleries.

Dear Ms. Purvines:

As we recently were discussing, the draft ZOU provides for a new "Main Street" zone which allows brew pubs by right and micro-breweries or commercial breweries with a CUP. Apparently a distillery (or even a micro-distillery) would only be allowed in industrial/ R&D zones or as an accessory use to a winery in an AG zone under the current draft.

In view of the recent success of micro-breweries, micro-distilleries are also becoming more and more popular. I have included a Wikipedia article regarding micro-distilleries.

California has recently relaxed the state requirements for such a business. Of course micro-distilleries are still regulated by strict federal regulations.

I have an interest in establishing a micro-distillery in a proposed Main Street zone in downtown Camino. It seems that that type of use and activity would be no different than a micro-brewery or brew pub.

The opportunity to be able to engage in a micro-distillery, as well as a micro-brewery or brew pub, in Main Street commercial zone would be a great asset for attracting tourists and economic development in these zoning classifications, especially downtown Camino where the mill closure has devastated the downtown economy.

It is respectfully requested that the Main Street zone include a micro-distillery (with appropriate limiting definitions regarding quantity and sales similar to the differences between brew pub/micro-breweries and commercial breweries).

Thank you.

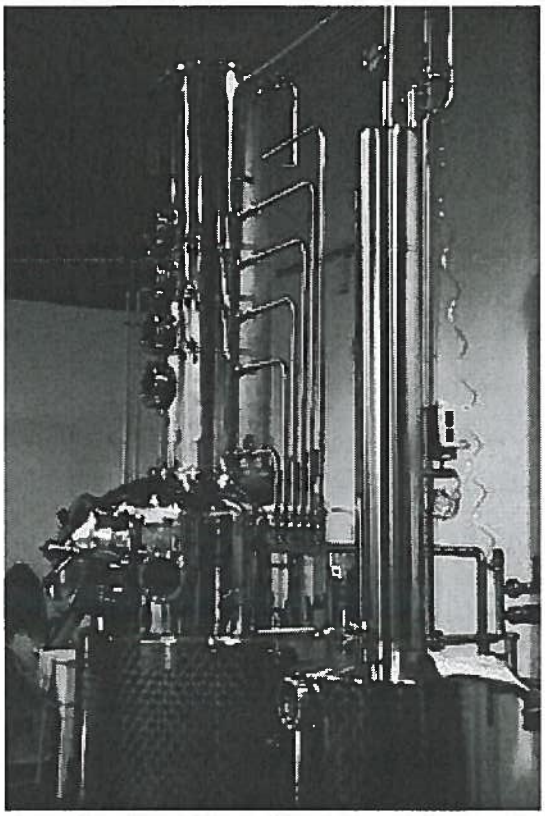
Sincerely,

Thomas R. Van Noord

TVN/cc
Enclosure(s):
cc: Ron Mikulaco; Ray Nutting; Brian Veerkamp; Ron Briggs; Norma Santiago

Search Wikipedia

Microdistillery



A custom-made 400 liter Kothe hybrid pot-column still operated by the Catoctin Creek Distilling Co. of Purcellville, Virginia.

A **microdistillery** is a small, often 'boutique', distillery established to produce beverage grade alcohol in relatively small quantities. While the term is most commonly used in the United States, micro-distilleries have been established in Europe for many years, either as small cognac distilleries supplying the larger cognac houses, or as distilleries of single malt whisky originally produced for the blended Scotch whisky market, but whose products are now sold as niche single malt brands. The more recent development of micro-distilleries can now also be seen in locations as diverse as London, Switzerland and South Africa.

Throughout much of the world, small distilleries operate throughout communities of various sizes, mostly without being given a special description. Due to the extended period of Prohibition in the United States, however, most small distilleries were forced out of business, leaving only the corporate-dominated megadistilleries to resume operation when Prohibition was repealed to produce small batch brands. Most microdistilleries in South Africa ceased to exist when legislation was introduced in 1964 that made

it almost impossible for small, private distilleries to operate viably. The legislation was relaxed again in 2003 and although most distilling expertise was lost, it was recovered by a new generation of microdistillers and has grown since.

A recent trend in this segment of the distilling industry is for megadistillers to create their own micro-distillery within their current operation. Makers Mark, owned by Jim Beam Inc., and Buffalo Trace in Kentucky are now producing specialty bourbon brands with small stills. It is anticipated that other megadistilers, Bacardi, Brown Forman, Pernod Ricard and Diageo, will soon join the parade.

Movement

The modern microdistilling movement grew out of the beer microbrewing trend, which originated in the United Kingdom in the 1970s and quickly spread throughout the United States in the following decades. While still in its infancy, the popularity of microdistilling and microdistilled. spirits is expanding consistently, with many microbreweries and small wineries establishing distilleries within the scope of their brewing or winemaking operations. Other microdistilleries are farm-based.[1] Anchor Brewing Company, Ballast Point Brewing Company, and Dogfish Head are examples of American craft breweries that have begun expanding into microdistillation. Leopold Bros. is an example of a microdistiller that began as a microbrewery, and now operates as a distillery alone.[2][3]

Some of the newer microdistilleries produce only spirits. Plain and seasonally-flavored vodkas are popular products.[1] As with the emergence of microbrewing, California and Oregon have experienced the highest number of microdistillery openings. Significant recent growth has also occurred in the Midwest.[1] Microdistilleries for gin and vodka have also now started to re-emerge in London, England, after being restricted and effectively banned for over a hundred years due to UK government restrictions on still sizes, which have now been partially relaxed. There are now five licensed distilleries in London: Beefeater, and Thames Distillers, and four microdistilleries: the City of London Distillery, The London Distillery Company, Sacred Microdistillery and Sipsmith. At the same time, European micro-distilleries have been a key element in the absinthe renaissance in several countries, including Switzerland.[4]

South Africa has experienced a relative big growth in microdistilleries and produces mainly pot distilled brandies, fruit brandies, fruit based eau de vie (locally called mampoer), husk based spirits (like Italian Grappa) and a wide range of liqueurs and flavoured vodkas. A local microdistillery training academy, Distillique,[5] is one of the few training academies worldwide which provides craft and microdistiller training courses on a regular monthly basis for microdistillers. Microdistillers include the Jorgensen's distillery,[6] Dalla Cia Distillery,[7] Nyati Jjj Distillery, Schoemanati distillery,[8] Tanagra distillery [9] and Wilderer Distillery.[10]

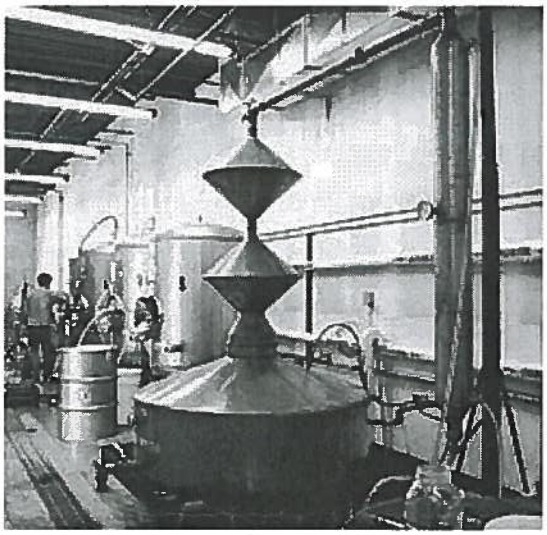
In the 1990s the liquor industry established the notion of super premium spirits offering a higher-quality (and usually more elaborately packaged) product at a higher price. The higher prices created an opportunity for small distilleries to profitably produce niche brands of exotic spirits that did not need

massive economies of scale to maintain profitability. The first decade of the new millennium saw the creation of hundreds of such distilleries producing products that were designed and marketed in a way that resembled celebrated restaurants more than alcoholic spirits marketing. Numerous competitions and publications were formed to support the burgeoning sub-culture of spirits.[11][12]

It is no longer the case that microdistilleries are producing at the premium end of the market only; the established brands are under threat from local microdistilleries at all price points (with the possible exception of the ultra discount supermarket brands such as Sainsbury's and Tesco's "value" brands, which are close to loss leaders).

Innovation

Microdistillers often experiment with new techniques to produce new flavors.[13] Tony Conigliaro uses a rotavap (i.e. glassware not copper pot) on a small scale to produce distilled spirits which change from day to day in his bar, and Ian Hart uses vacuum equipment to conduct distillation at much reduced temperatures, resulting in less cooked aromatics.[14]



A Double Diamond pot still used by Downslope Distilling of Centennial, Colorado.

U.S. regulation

The U.S. Government regulates distilleries to a high degree and currently does not distinguish its treatment of distilleries in terms of size. This stringent regulation has prevented microdistilling from developing as rapidly as microbrewing which enjoys relatively more relaxed government control. A number of states, such as California, Indiana, Iowa, Kansas, Michigan, Utah and Washington, have passed legislation reducing the stringent regulations for small distilleries that were a holdover from

prohibition.[1] The Bureau of Alcohol, Tobacco, and Firearms (BATF) and the Alcohol and Tobacco Tax and Trade Bureau (TTB) are responsible for enforcing Federal statutes as they apply to all manufacturers of beverage alcohol.

South African regulations

Craft distillery

The distillation of spirits has its roots deep in American history, however the terms "craft distillery" and "craft distilling" are becoming more common in the nomenclature of American society. The term "craft" brings to mind the idea of smaller batches of distilled liquors being made in a family setting. Although the family aspect may come into play some of the time, the term "craft distilling" refers mostly to the concept of starting with raw materials and creating distilled liquors with the same attention to detail that was normal in the earlier history of the United States.

Craft distilling is a catch phrase for some, used for marketing purposes. However, many craft distillers consider that in order to be true to the art of making distilled liquors one must not only care about the end result, but also about the process and the impact of its production.[15] In this way craft distilling sets itself apart from the larger, more established distilleries.

A craft distiller is actively involved in every aspect of the distillation of the spirit, from ingredient selection to bottling and labeling. Some Craft Distilleries take this one step further and even grow the grains they use to produce distilled liquors. One, Mad Buffalo Distillery,[16] a farm distillery in Union, Missouri, controls every aspect of their product, from growing and harvesting their grain, fermenting, distilling, aging, bottling, labeling, all on their family farm.[17]

See also

Footnotes

References

External links

Last modified 4 months ago

File Number: 280967

Draft EIR Received from Email

First Name	Rob & Gloria	Last Name	Vernon
Address	Thompson Hill Road	Email Address	rgvernon@directcon.net
City	Placerville	Add Email Address?	
State	CA	Zip Code	95667
Parcel Number		Organization or Agency	
		Primary Interest	ZOU
Comments:	View Scanned Doc	Ag Opt In	Comment Date: 04/01/2014

We would like to voice our support for the proposed changes to the County ordinance "Off-road Vehicle Use" per Section 17.40.210 E. We have a problem in this neighborhood that this change would help address. Namely, a guy who has a moto-cross track in his "backyard" and who invites all his buddies to come play. The noise and dust is is irritating to say the least, and impacts the whole neighborhood. And his attitude is "F*** 'em!" I don't think that this kind of activity and attitude is in keeping with the community, where the rest of us just want to enjoy our properties in peace. This ordinance change would help in addressing these kinds of issues. Rob & Gloria Vernon Thompson Hill Rd. 530-621-2468 (Comment submitted on 3/31/14 7:44 AM via LRP Web Pages Feedback, 4/1/14.an)

File Number: 280968

Draft EIR Received from Email

First Name	Lawrence & Jane	Last Name	Alexander
Address	4401 Fawn Street	Email Address	Lawrie@Britcars.com
City	Shingle Springs	Add Email Address?	
State	CA	Zip Code	95682
Parcel Number		Organization or Agency	Deer Hills Property Owners Association
		Primary Interest	Both
Comments:	View Scanned Doc	Ag Opt In	Comment Date: 04/09/2014

We are writing to notify you of our opposition to a proposed rezoning through the Targeted General Plan Amendment and Zoning Ordinance Update of property adjacent to our neighborhood. Parcel APN 319-260-01 is a 62 acre parcel located at the northwest corner of Mother Lode and Greenstone. The 62 Acre Parcel borders our neighborhood, known as Deer Hills, located just west of Greenstone and north of Motherlode Drive (Fawn Street, Doe Street and Buck Street). The 62 Acre Parcel is currently zoned RE-5. However, it is proposed to be amended to Research & Development (R&D) to be consistent with the Land Use Designation in the General Plan. This proposed rezoning would allow uses that are a huge leap from the adjacent zoning of Deer Hills, which comprises 45 three-acre parcels currently zoned medium density residential. The R & D designation is an incompatible land use directly adjacent to a rural neighborhood. In response to the Environmental Impact Report we, as owners of a home in Deer Hills, oppose the rezoning of the 62 Acre Parcel to R & D. R&D Zoning would allow businesses to be located such as Manufacturing, Hazardous Materials Handling, Restaurants, Storage and Distribution, Laboratories and other Industrial Uses. Such permitted uses would have significant undesirable consequences for our rural neighborhood such as: ❙ Noise pollution from large trucks or machinery ❙ Light pollution from late night activities and/or security ❙ Chemical pollution ❙ Commercial/Industrial buildings and equipment within sight of our homes ❙ Increased traffic on the already crowded Motherlode Drive Rezoning the 62 Acre Parcel to R&D is simply wrong for Deer Hills. Instead, we support a General Plan Amendment to change the Land Use Designation of the 62 Acre Parcel to RE-5, or other Residential Use. Please give serious consideration to our concerns in your decisions regarding amending the Zoning for the Parcel APN 319-260-01. Thank you.

File Number: 280969

Draft EIR Received from Email

First Name	Bill	Last Name	Draper
Address	4645 Meadowlark Way	Email Address	cbdrapers@gmail.com
City	Placerville	Add Email Address?	
State	CA	Zip Code	95667
Parcel Number		Organization or Agency	Registered Professional Forester
		Primary Interest	Both
Comments:	View Scanned Doc	Ag Opt In	Comment Date: 04/13/2014

I am not sure how any development on TPZ, FR, RR or NR such as health, resort and retreat centers can be allowed by right. First a Timberland Conversion Permit must be obtained from the State of California. There is no mention of this step in your draft document. The entire process of seeking a permit from the County becomes moot if the state permit is not granted. These type of projects have major impacts on law enforcement, fire, transportation, water quality and schools. Annexation into the appropriate fire and school district needs to be required. Without a specific case by case review, any project is going to have impacts more than "less than significant".

File Number: 280970

Draft EIR Received from Email

First Name	Richard	Last Name	Boylan, Ph.D.
Address	P.O. Box 1009	Email Address	drboylan@outlook.com
City	Diamond springs	Add Email Address?	
State	CA	Zip Code	95619
Parcel Number		Organization or Agency	Protecting Indian Creek Oaks
		Primary Interest	Both
Comments:	View Scanned Doc	Ag Opt In	Comment Date: 04/16/2014

The Draft EIR and associated Land Use Maps on-line are imprecise, inadequately if at all labeled, and lacking detail to make positive identification of affected lands. It appears that the Land use Policy Programmatic Update (LUPPU) proposes high-density developments (large subdivisions) in areas of Diamond Springs and El Dorado where local citizens have repeatedly stated that they do not want such developments, and that such developments assail the local community's rural, historic and natural character. I reject the EIR as totally inadequate, flawed, and failing to provide a clear, transparent, contextualized, and community-relevant statement of local impacts.

File Number: 280971

Draft EIR Received from Email

First Name	Jim	Last Name	Copeland
Address	1136 Bush Ct.	Email Address	jimcope@comcast.net
City	Placerville	Add Email Address?	
State	CA	Zip Code	95667
Organization or Agency	Self		
Parcel Number		Primary Interest	ZOU
Comments:	View Scanned Doc	Ag Opt In	Comment Date: 04/17/2014

Why is it so hard to find the specific proposed zoning categories? How do I do it? Even a staff member at the Planning Dept. the other day couldn't find them and needed help. Thank you.

File Number: 280972

Draft EIR Received from Email

First Name	Jake	Last Name	Lee
Address	7931 Oakhill Lane P.O. Box 45	Email Address	jake.gloria@yahoo.com
City	Pilot Hill	Add Email Address?	
State	CA	Zip Code	95664
Organization or Agency			
Parcel Number		Primary Interest	Both
Comments:	View Scanned Doc	Ag Opt In	Comment Date: 04/18/2014

The specific interest here is in change to an agricultural designation as to land use for our 30+ acre parcel (#10418002) from residential. If there is an option to do so, please accept this as an expression of our desire to do so

File Number: 280973

Draft EIR Received from Email

First Name	Diane	Last Name	Lehr
Address	4455 Fawn Street	Email Address	djdoxie@comcast.net
City	Shingle Springs	Add Email Address?	
State	CA	Zip Code	95682
Parcel Number		Organization or Agency	
		Primary Interest	TGPA
Comments:	View Scanned Doc	Ag Opt In	Comment Date: 04/18/2014

Dear Board of Supervisors, I am writing to notify you of our opposition to a proposed rezoning through the Targeted General Plan Amendment and Zoning Ordinance Update of property adjacent to our neighborhood. Parcel APN 319-260-01 is a 62 acre parcel located at the northwest corner of Mother Lode and Greenstone. The 62 Acre Parcel borders our neighborhood, known as Deer Hills, located just west of Greenstone and north of Motherlode Drive (Fawn Street, Doe Street and Buck Street). The 62 Acre Parcel is currently zoned RE-5. However, it is proposed to be amended to Research & Development (R&D) to be consistent with the Land Use Designation in the General Plan. This proposed rezoning would allow uses that are a huge leap from the adjacent zoning of Deer Hills, which comprises 45 three acre parcels currently zoned medium density residential. The R & D designation is an incompatible land use directly adjacent to a rural neighborhood. In response to the Environmental Impact Report, George and Diane Lehr as an owner of a home in Deer Hills, oppose the rezoning of the 62 Acre Parcel to R & D. R&D Zoning could allow businesses to be located such as Airports, Airstrips, or Heliports, Hazardous Materials Handling, Restaurants, Churches, Recreational Facilities and Industrial Uses. Such permitted uses would have significant undesirable consequences for our rural neighborhood such as: Noise pollution from large trucks or machinery Light pollution from late night activities and/or security Chemical pollution Commercial/Industrial buildings and equipment within sight of our homes (Add your own) Rezoning the 62 Acre Parcel to R&D is simply wrong for Deer Hills. Instead, we support a General Plan Amendment to change the Land Use Designation of the 62 Acre Parcel to RE-5, or other Residential Use. Please consider our concerns in your decisions regarding amending the Zoning for the Parcel APN 319-260-01. Sincerely, Diane and George Lehr Deer Hills Homeowner

File Number: 280974

Draft EIR Received from Email

First Name	Aaron	Last Name	Klinger
Address	4178 Hawk View Road	Email Address	aklinger@mindspring.com
City	El Dorado Hills	Add Email Address?	
State	CA	Zip Code	95762
Parcel Number		Organization or Agency	
		Primary Interest	Both
Comments:	View Scanned Doc	Ag Opt In	Comment Date: 04/19/2014

A DEIR correction (or notice of error) is needed in reference to the review and public comment duration specified on page ES-18. The comment period dates are correct; the specified 60 day period is not. There should be no opportunity for a future claim of misleading or contradictory notice quashing adequate public review.

File Number: 280975

Draft EIR Received from Email

First Name	Scott	Last Name	Keeling
Address	1040 Paso Diablo Ct.	Email Address	skeeling51@gmail.com
City	Placerville	Add Email Address?	
State	CA	Zip Code	95667
Parcel Number		Organization or Agency	property owner
		Primary Interest	Both
Comments:	View Scanned Doc	Ag Opt In	Comment Date: 04/14/2014

My parcel 060 401 32 is currently zoned 1/2 general commercial and 1/2 commercial.It is surrounded by general commercial and mineral reserve properties. The proposed zoneing for my parcel is a more restrictive commercial limited. For my intended use I will require the general commercial zoning at least on the part where it exists. I have contacted county planners in the past with my concerns but the plan has not changed. It is unclear to me why the most restrictive zoning is applied to this parcel considering the surrounding zoning. Also this change was made without any contact with the land owner.

File Number: 280976

Draft EIR Received from Email

First Name	Katie	Last Name	Huff
Address	3072 Latham Lane	Email Address	katiejane.huff@gmail.com
City	El Dorado Hills	Add Email Address?	
State	CA	Zip Code	95762
Parcel Number		Organization or Agency	
		Primary Interest	Both
Comments:	View Scanned Doc	Ag Opt In	Comment Date: 04/27/2014

- Zoning Parcel Map does not work, I cannot locate the identified area on a map - ES-8BIO-1a: Limit the relaxation of hillside development standards. THIS IS NOT SUPPORTED IN THE DOCUMENT WITH ENGINEERING STANDARDS THAT WILL BE IMPLEMENTED OR REGULATED TO ENSURE THAT PROPER STANDARDS AND REGULATIONS ARE FOLLOWED. - I FEEL LIKE BUILDING ON THE HILL SIDES OF EDH IS GOING TO DECREASE MY HOME VALUE, YOU ARE NOW TAKING OPEN SPACES AND JUST CREATING A CONGESTED AREA THAT WILL NO LONGER HAVE THE SAME FEEL AND QUALITY OF LIFE THAT I CURRENTLY HAVE IN EDH. YOU WILL HAVE TO ANALYZE THE IMPACT TO THE HOMES, DECREASE IN VALUE TO HAVE AND CONSIDER THE IMPACT TO THE NEIGHBORS, QUALITY OF LIFE MIGHT EQUATE TO YOU BUYING OUT PEOPLE. - HOW ARE YOU GOING TO REDUCE CONSTRUCTION NOX EMISSIONS, ARE YOU REGULATING GREENHOUSE GAS EMISSIONS. ALL CONSTRUCTION SHOULD ONLY BE OPERATING ON TIER 4 EQUIPMENT IN 2015 PER LAW - I DONT UNDERSTAND HOW YOU ARE GOING TO REGULATE AND TEST FOR NATURAL OCCURRING ABESTOS IN THE SOIL. I NEED TO SEE THE DOCUMENT,T TESTING AND REPORTS ON THE STATUS OF THIS ACTIVITY. THIS IS A HUGE FACTOR IN THE EL DORADO AREA AND HAS LARGE IMPACTS TO THE RESIDENTS OF THIS AREA. IT COULD CAUSE HEALTH IMPACTS IF YOU ARE NOT TREATING THE CONSTRUCTION SITE ACCURATELY. WHAT ARE YOU DOING TO ENSURE THAT THIS IS TESTED DURING EXCAVATION, DISPOSAL AND DURING EACH NEW FEATURE OF WORK - WITH NEW DEVELOPMENT OF HOMES THE DEVELOPER SHOULD BE CONSIDERING HOW THEY CAN TAKE HOMES OFF THE GRID NOT TO RELY ON WATER SOURCES AND PUT A LARGER

250994

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: COmment of EIR Draft

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 1, 2014 at 9:21 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

---------- Forwarded message ----------
From: **Planning Unknown** <planning@edcgov.us>
Date: Tue, Jul 1, 2014 at 9:19 AM
Subject: Re: COmment of EIR Draft
To: Chuck Beckwith <beckwithchuck@gmail.com>, Shawna Purvines <shawna.purvines@edcgov.us>

I will forward your comments on to the Long Range Planning Division.

Thanks.

Joe Prutch
Planning Services

On Fri, Jun 20, 2014 at 12:39 PM, Chuck Beckwith <beckwithchuck@gmail.com> wrote:

---------- Forwarded message ----------
From: **Chuck Beckwith** <beckwithchuck@gmail.com>
Date: Thu, Jun 19, 2014 at 4:03 PM
Subject: COmment of EIR Draft
To: TPGA-ZOU@edcgov.us

My name is Charles Beckwith and my address is 3055 Latham Ln, Eldorado Hills CA 95762
After reviewing the Executive Summary of the Draft EIR for the proposed changes to the County TGPA/ZOU and have the following comments concerning the Impacts and Mitigation Table. Overall I believe the EIR Document did not make an exhausting effort to develop suggested mitigation strategies for the identified impacts, including the impacts for no change to the general plan or zoning regulations.

Table ES-1 Impact and Mitigation

- AES 1 & AES 3 Revise the mitigation strategy from "limit relaxation of hillside development' to " do not relax hillside development"
- AES 4 Revise mitigation strategy to include revision to proposed zoning ordinance would forbid development that created a new source of light or glare.
- AQ 1 -7. Revise document to include migration measures that would substantially reduce or eliminate the identified impacts.
- BIO 1-4. Revise the mitigation strategy in the document from "limit" to

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"forbid" relaxation of hillside development and forbid music festivals

- LU 1,2 &3. Change the current document's level of significance to "S" and include mitigation strategies.
- NOI 1-5. Revise the document to include mitigation strategies that will reduce the noise level to the pre development level.
- PH1-3. Revise the document to include mitigation strategies, including a strategy to forbid development that induces substantial population growth.
- TRA 2-6. Revise document to include mitigation strategies that will allow development to have no impact on the current transportation circulation system and congestion management.
- WS-1 Revise document to include a mitigation strategy that will identify new sources of water supplies that will eliminate the impact of development on existing supplies.

–

Shawna L. Purvines
Community Development Agency, Long Range Planning
County of El Dorado
2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362
Fax: (530) 642-0508
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If you receive this e-mail in error please contact the sender by return e-mail and delete the material from your system.
Thank you.

250995

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Re: Guidelines vs Standards

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 1, 2014 at 4:07 PM
To: Kathy McCoy <kathy@mccoypartners.com>
Cc: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

Thanks Kathy for following up on our conversation.

Shawna

On Tue, Jul 1, 2014 at 3:35 PM, Kathy McCoy <kathy@mccoypartners.com> wrote:

> Shawna,
>
> As I expressed the other day, it is crucial that we clearly define Standards and then guidelines towards meeting them. People seem to think they are interchangeable.
>
> *Kathy*

–

Shawna L. Purvines
Community Development Agency, Long Range Planning
County of El Dorado
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www.edcgov.us

250996

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Zoning Ordinance Update

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Mon, Jul 7, 2014 at 12:47 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **Design Coordinator** <design@auburnlaketrails.org>
Date: Wed, Jul 2, 2014 at 10:17 AM
Subject: Zoning Ordinance Update
To: shawna.purvines@edcgov.us

Hi Shawna. Tom Dougherty suggested I contact you with my questions on the proposed Zoning Ordinance Update.

Auburn Lake Trails is a property owners association in Cool. We have a Development Plan with the county.

I noticed that some of our common area parcels are proposed to change zoning with the new update. Can you answer some questions for me, or direct me to someone else?

We can use APN 072-173-01 as an example.

Current zoning is R2A. Proposed zoning is RF-L.

Will the new zoning designation restrict us from selling this lot to one of the adjacent lot owners in the future?

If we can sell it, could the new owner combine the two lots under the residential zoning designation?

For APN 072-160-03:

What is the Land Use Overlay: CO (listed on the proposed zoning map when I search for this apn).

What is the Current Land Use: OS?

Also, for APN 072-052-01 (our office building), it shows a zoning overlay of DC. Can you explain what that designation is?

APN 073-494-07 indicates the current zoning is AE. What is that?

250996

I also notice a Zoning Overlay: PL on residential lots. Can you tell me what that is?

On the map, there is also a heavy blue line around Cool and a portion of Auburn Lake Trails. The legend describes it as a "Rural Center". Can you explain that and why ALT is included?

Thank you so much for any help or guidance you can give me.

Regards,

Pam Sheil

Design Committee Coordinator / Compliance Officer

Auburn Lake Trails POA

1400 American River Trail

Cool, CA 95614

530-885-6526 x17

530-885-6739 fax

–

Shawna L. Purvines
Community Development Agency, Long Range Planning
County of El Dorado
2850 Fairlane Court

250996

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shawna.purvines@edcgov.us
www.edcgov.us

250997

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: current changes

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Mon, Jul 7, 2014 at 12:49 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

——— Forwarded message ———
From: <yourfamilytrust@aol.com>
Date: Tue, Jun 17, 2014 at 8:14 AM
Subject: current changes
To: Shawna.purvines@edcgov.us

Shawna and all concerned, The current general plan has my property at 3440 Wedge Hill Rd. (APN 32726027100) to be re-zoned from general commercial to residential.The selling point, at the time of purchase, was the possibility of a future commercial sale.We have been approached by developers in the past and have hopes of benefitting from the current growth in the area. Your decision could mean the difference between $50,000 and $500,000. In the last 10 years I have seen my IRA,401K and home equity dwindle to almost nothing and this property is my last hope. Please re-consider any changes in this matter. Sincerely, Gregory Rezak

–

Shawna L. Purvines
Community Development Agency, Long Range Planning
County of El Dorado
2850 Fairlane Court
Placerville, CA 95667
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Fax: (530) 642-0508
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260991

LAW OFFICE OF LARRY T. RING

12150 HERDAL DRIVE
AUBURN, CA 95603
PHONE: 530.885.7836/FAX: 530.495.4161
WWW.LRINGLAW.COM
LARRY@LRINGLAW.COM

June 12, 2014

El Dorado County Planning Department
2850 Fairlane Court, Bldg. C
Placerville, CA 95667

Dear Planners,

I am writing with regard to a parcel in Pilot Hill...APN number 104-250-09-10. This parcel lies on the west side of Salmon Falls Road – across the street from the current commercial 'core' in Pilot Hill.

The subject parcel is adjacent to, and surrounded by, nothing but residentially-zoned and developed parcels, yet, somehow, it received a commercial land use designation in the 2004 General Plan. Zoning for the parcel is still residential, although the realtor selling the parcel is advertising that the "...planning department will change the zoning from R1A to commercial..."

How that parcel ever received a commercial land use designation in the first place is baffling to me. It represents the worst in leapfrog land use and zoning, as none of the other parcels on that side of Salmon Falls Road are designated as commercial.

Pilot Hill certainly doesn't 'need' any more commercial development. The current commercial complex on the east side of Salmon Falls Road has sat 66% vacant for YEARS. The other commercial use on the east side of Salmon Falls Road, the Pilot Hill Mobile Home Park, is, thanks to this brilliant planning, a community eyesore due to deferred maintenance and upkeep by its owner.

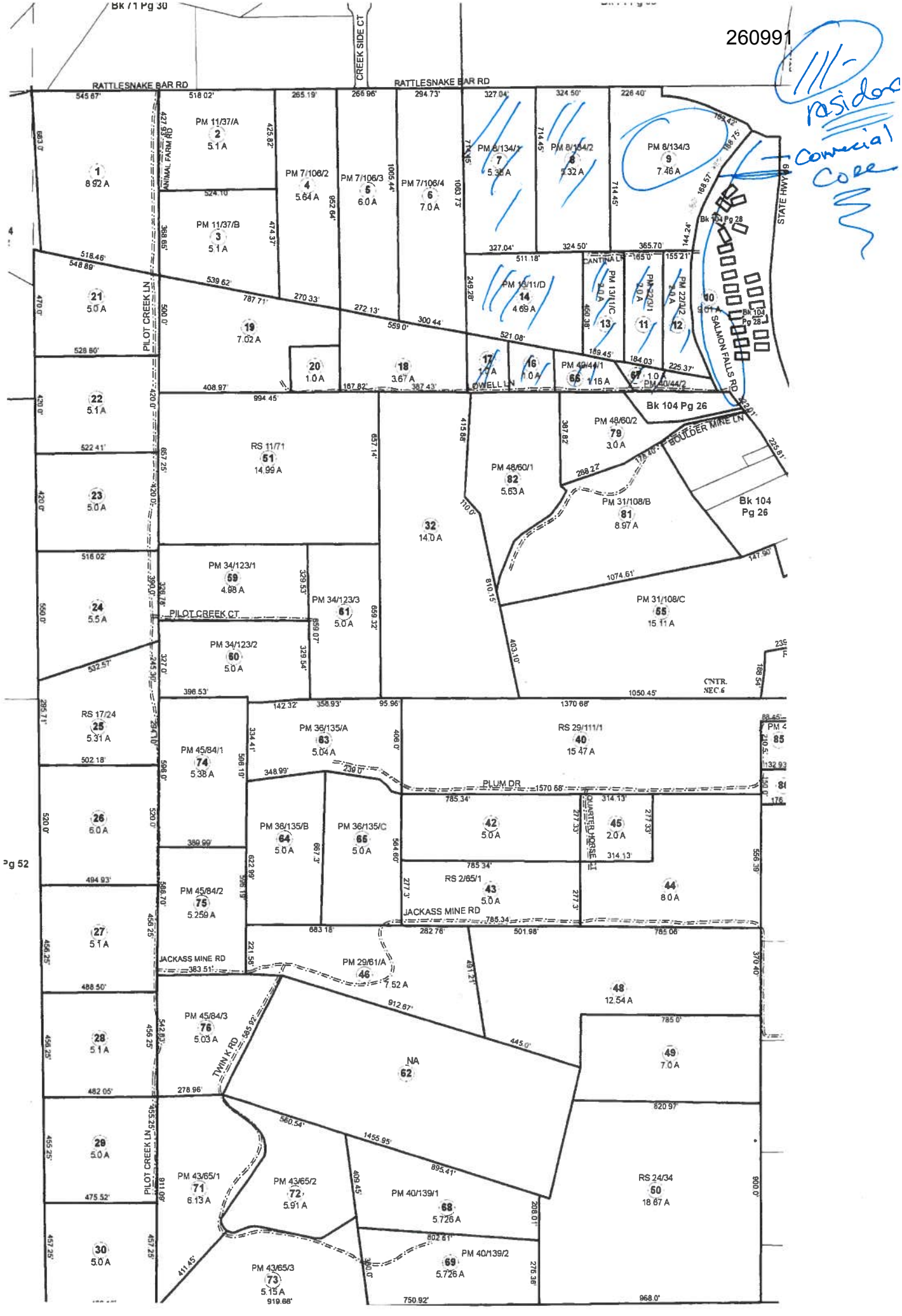
Please consider this to be a formal request to (1) revisit the land use designation on APN 104-250-09-10 and, most critically, (2) deny any future rezoning of the property to commercial, unless and until a true need for more commercial development in Pilot Hill is identified.

Allowing commercial development to **cross** Salmon Falls Road into the residential parcels is a complete travesty...particularly since there is absolutely NO need for such leapfrog development and its attendant decrease in property values for those residential parcels adversely affected by a leapfrogged commercial use.

I would appreciate a formal written response to this request from your Department.

Sincerely,

Lawrence T. Ring
Attorney at Law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Bk 71 Pg 30
CREEK SIDE CT
RATTLESNAKE BAR RD
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ANIMAL FARM RD
PM 11/37/A
2
5.1 A
PM 11/37/B
3
5.1 A
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8.92 A
PM 7/106/2
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5.64 A
PM 7/106/3
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PM 7/106/4
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PM 8/134/3
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7.46 A
STATE HWY 49
Bk 104 Pg 28
PM 13/11/D
14
4.69 A
CANTINA LN
PM 13/11/C
13
2.0 A
PM 32/3/1
11
2.0 A
PM 22/2/2
12
2.0 A
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9.01 A
SALMON FALLS RD
Bk 104 Pg 28
21
5.0 A
PILOT CREEK LN
19
7.02 A
20
1.0 A
18
3.67 A
17
1.0 A
16
1.0 A
OWELL LN
PM 40/44/1
66
1.16 A
67
1.0 A
PM 40/44/2
Bk 104 Pg 26
22
5.1 A
RS 11/71
51
14.99 A
PM 48/60/2
79
3.0 A
BOULDER MINE LN
PM 48/60/1
82
5.63 A
23
5.0 A
32
14.0 A
PM 31/108/B
81
8.97 A
Bk 104
Pg 26
PM 34/123/1
59
4.98 A
PM 34/123/3
61
5.0 A
PILOT CREEK CT
24
5.5 A
PM 34/123/2
60
5.0 A
PM 31/108/C
55
15.11 A
CNTR.
SEC.6
RS 17/24
25
5.31 A
PM 45/84/1
74
5.38 A
PM 36/135/A
63
5.04 A
RS 29/111/1
40
15.47 A
PLUM DR
26
6.0 A
PM 36/135/B
64
5.0 A
PM 36/135/C
65
5.0 A
42
5.0 A
45
2.0 A
CHARTER HORSE TR
RS 2/65/1
43
5.0 A
44
8.0 A
PM 45/84/2
75
5.259 A
JACKASS MINE RD
JACKASS MINE RD
27
5.1 A
PM 29/61/A
46
7.52 A
48
12.54 A
PM 45/84/3
76
5.03 A
TWIN K RD
NA
62
49
7.0 A
28
5.1 A
29
5.0 A
PM 43/65/1
71
6.13 A
PM 43/65/2
72
5.91 A
PM 40/139/1
68
5.726 A
RS 24/34
50
18.87 A
PILOT CREEK LN
30
5.0 A
PM 43/65/3
73
5.15 A
PM 40/139/2
69
5.726 A
Pg 52

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TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: current changes

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Mon, Jul 7, 2014 at 12:49 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: <yourfamilytrust@aol.com>
Date: Tue, Jun 17, 2014 at 8:14 AM
Subject: current changes
To: Shawna.purvines@edcgov.us

Shawna and all concerned, The current general plan has my property at 3440 Wedge Hill Rd. (APN 32726027100) to be re-zoned from general commercial to residential.The selling point, at the time of purchase, was the possibility of a future commercial sale.We have been approached by developers in the past and have hopes of benefitting from the current growth in the area. Your decision could mean the difference between $50,000 and $500,000. In the last 10 years I have seen my IRA,401K and home equity dwindle to almost nothing and this property is my last hope. Please re-consider any changes in this matter. Sincerely, Gregory Rezak

--

Shawna L. Purvines
Community Development Agency, Long Range Planning
County of El Dorado
2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362
Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

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TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Re: Guidelines vs Standards

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 1, 2014 at 4:07 PM
To: Kathy McCoy <kathy@mccoypartners.com>
Cc: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

Thanks Kathy for following up on our conversation.

Shawna

On Tue, Jul 1, 2014 at 3:35 PM, Kathy McCoy <kathy@mccoypartners.com> wrote:

> Shawna,
>
> As I expressed the other day, it is crucial that we clearly define Standards and then guidelines towards meeting them. People seem to think they are interchangeable.
>
> *Kathy*

--

Shawna L. Purvines
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TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

TGPA DEIR comments

1 message

Charlene Hensley <hensleycharlene@gmail.com> Mon, Jul 21, 2014 at 2:19 PM
To: tgpa-zou@edcgov.us

Following are my comments on the DEIR for the TGPA and ZOU. I have attached a file with my comments, as well as copied and pasted them here, in case one or the other way of emailing does not work. Both the following email copy and the attachment are the same.
Thank you.
Charlene Hensley
2764 Ponderosa Road
Shingle Springs, CA 95682
530-677-2048
hensleycharlene@gmail.com

Comments by
Charlene Hensley
on the Draft Environmental Impact Report
for the Targeted General Plan Amendment and Zoning Ordinance Updates

A. ORGANIZATION AND INFORMATION

The Draft Environmental Impact Report (DEIR) is poorly organized and full of jargon, numbers, and initials that are not fully explained. The DEIR goes back and forth between the 2004 plan and its EIR and the TGPA and its DEIR. It is very confusing and hard to follow and keep straight just what one is looking at. It is equally hard to ferret out and examine the proposed changes and their impacts and mitigations.
At times, mitigations are either stated as current policies in the General Plan, and/or described as, for example, "Mitigation Measure AG-1a" or some other similar designation. This requires checking back and forth to other pages to try to find just what each mitigation entails.
For example:
RE: Proposed Amendment to Policy 7.1.2.1, etc.

"General Plan Policy 7.4.2.2,…would limit the impact. Implementation of Mitigation Measure BIO-1a would reduce this impact to a less-than-significant level."
The DEIR is a failure as an informative document that provides the public and decision-makers a clear understanding of the impacts and mitigations of the proposed changes.

B. BASELINE DEFINITION

In many places the DEIR compares possible impacts caused by the Targeted General Plan Amendment (TGPA) to those discussed in the EIR for the 2004 General Plan and to the 2004 General Plan itself, instead of assessing the impacts of the Targeted Amendment on the existing environment.

For example:

"This DEIR analyzes whether these proposed changes would result in impacts on biological resources that would not be reasonably foreseeable under the existing General Plan and Zoning Ordinance." It should discuss impacts on the existing environment, period.

"This DEIR analyzes whether these proposed changes, including the changes in residential densities in some commercial/Mixed Use and multi-Family Residential areas, would result in impacts on these existing resources that would not occur
under the existing General Plan and Zoning Ordinance." There should be a period after "existing resources," leaving the current General Plan and Zoning Ordinance out of the sentence.

"The Analysis focuses on the proposed changes to the General Plan, differentiating them to the extent possible, from impacts that are attributable to the General Plan as a whole." The impacts of the proposed changes should have nothing to do with the existing General Plan. The impacts of the TGPA and ZOU should be described for the current environment. A "plan-to-plan" evaluation is not what is called for by CEQA.

This is part of the reason that the DEIR is misleading and difficult to follow. The DEIR often assumes that the environmental baseline is what is allowed in

the current general plan, which is not what CEQA requires. You must assess the impacts of the proposed changes to the existing environment. The existing environment is either not discussed at all in the DEIR or described in broad, general, and vague terms. This is excused by explaining that there is no specific project, so the specific environment cannot be know.
The actual existing environments that could be affected, such as rural residential areas, are not described in a way that would truly help estimate the possible impacts of the changes. This is a major failure of this DEIR. The right of the public to be adequately informed about environmental impacts has not been fulfilled.

C. NO SPECIFIC PROJECT

It is hard to even know what is proposed and what the possible impacts of the proposals would be.
The proposed changes are vague and left open to many different possibilities. Too often "no specific project" is used as an excuse to defer or disregard mitigation.

"No specific level of future development was forecast during this analysis because there is no reasonable way to know how many of the uses allowable under the project may be approved in the future, and the locations of such uses cannot be known at this time."

The description of possible "mixed uses" is so open as to be useless as a way to evaluate impacts. One cannot assess impacts without knowing the specific environment and the specific sort of project. There is a huge difference between an off-highway vehicle park and some sort of lodging. There is also a huge difference in possible environments--forest, open space, riparian, rural. Near or far from a road, near or far from residential areas, near or far from streams or wildlife habitat or migration corridors or oak groves. It is impossible to know impacts let alone comment on them, even though the DEIR states that there are many impacts, and some are "substantial and unavoidable."

D. THRESHOLDS OF SIGNIFICANCE for Biological Resources

The county should use the CEQA Appendix G guidelines.

The county's considerations do not include riparian habitat or wetlands. The Appendix G guidelines are more extensive and inclusive.

The County's thresholds leave out, in particular, two important considerations that should be included. They are:

"Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service."

"Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrological interruption, or other means."

1. Why are these particular considerations left out?

2. What studies have been done to affirm that the County's thresholds of significance are as effective in protecting the environment as the Appendix G guidelines?
Please include the studies and their conclusions in the Appendix of the final EIR.

3. What reason does the County have for using a different set of thresholds of significance?
Even though the reason stated is that the considerations used in the TGPA better "reflect the character of El Dorado County," there is no explanation of how the changed considerations accomplish that.
Please list the information used to determine how the changes made to the CEQA thresholds "reflect the character of El Dorado County" in the Appendix of the final EIR. Please discuss why these changes are important.

Please describe how the changed thresholds accomplish the goals of the CEQA Appendix G.

D. THE REAL REASONS FOR THE TGPA

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The TGPA seems to have only two purposes--to make more land available for development and to ease mitigation measures for environmental impacts caused by development.
If the main reasons for the proposed changes are to provide for more moderate-income housing and create jobs, what assurance is there that the proposed changes can even achieve those goals?

1. What studies were done to prove that the only way to achieve the goals of the TGPA is the proposed changes?
Please include the studies and findings in the appendix of the final EIR.

2. What studies were done to find if there are other, greener, more environmentally-friendly ways to achieve the same goals?
Please include the studies and findings in the appendix of the final EIR.

3. What sort of jobs will be created by the proposed changes to the General Plan? Who will fill them? Will they be for current residents? Will they be permanent or temporary? How well will they pay?
What studies were done to show what sorts of jobs will be created, how they will be created, and how many will be created?
Please describe how each proposed change will help create more jobs.
Please include the studies and findings in the appendix of the final EIR.

4. What assurance is there that the proposed changes will actually supply any moderate-income housing? How will the proposed changes allow for more moderate-income housing? What is the proof that there will be ANY moderate-income housing resulting from the proposed changes? Is it assured by these changes? What do you consider "moderate-income?" How was it determined?
Please describe how each change will help provide for more moderate-income housing.
Please include the studies and findings on this subject in the appendix of the final EIR.

5. What studies were done to determine whether there are other, less environmentally-damaging ways to achieve the goal of more moderate-income housing?

Please include the studies and findings in the appendix of the final EIR.

6. How do the TGPA, Zoning changes, and DEIR assure the achievement of the stated goals of the TGPA?
What studies were done to determine how the proposed changes in the General Plan will meet the goals of the TGPA?
Please include the studies and their findings in the appendix of the final EIR.

7. What other alternatives were studied that would achieve the goals of the TGPA with the equally-important goal of less damage to the environment?
Please list the studies involved in evaluating other ways to meet the stated goals of the TGAP in the appendix of the final EIR.

8. How will the proposed changes help maintain a rural atmosphere, wildlife habitat, water and air quality, scenic beauty?

9. Will they ease traffic congestion?

10. Will they increase the potential for growth--not based on the current general plan, but on the existing environment?

11. Do the citizens of El Dorado County benefit from the proposed changes? How do they benefit? What studies were done to assess how current residents benefit from the proposed changes?
Please include all studies and findings in the appendix of the final EIR.

12. Why were those goals chosen as the goals that El Dorado County should reach for? Why doesn't the county propose changes that will benefit current residents and the current environment? Things like more open space, safer, less congested roads, less air and light pollution, less water pollution, more scenic vistas, more rural atmosphere, preservation of more wildlife habitat, more riparian corridors, more contiguous and viable migration corridors and habitat, more retention of plant life and tree canopy????? Who is to say that those goals would not create jobs? Have studies been done to see if and how these sorts of goals can help the County and its residents?
Please include any studies in the appendix of the final EIR.

An example of the possible ways that the county could and should be protecting

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the environment rather than trampling on it is:

California Wetlands Conservation Policy
The goals of the California Wetlands Conservation Policy, adopted in 1993 (Executive Order W-59-93 [August 23, 1993]), are "to ensure no overall net loss, and achieve a long-term net gain in the quantity, quality, and permanence of wetlands acreage and values in California, in a manner that fosters creativity, stewardship, and respect for private property;" to reduce procedural complexity in the administration of state and federal wetlands conservation programs; and to make restoration, landowner incentive programs, and cooperative planning efforts the primary focus of wetlands Conservation.

This is just one of several State and Federal policies mentioned in the TGPA. How well has the County followed these policies? In this case, has there been no net loss in wetlands and a plan for long-term GAINS in wetlands quality, quantity and permanence?
Where are those plans and those statistics?
How has the County achieved this goal?
Is this goal considered as important as the changes to the General Plan which will, no doubt, cause loss of wetland acreage?
How is the County working to achieve the goals of the California Wetlands Conservation Policy?
How many acres have been preserved, how many gains have been made?
How are wetlands in the county being protected so there is no net loss and managed or regulated so there is a long-term gain?
Please demonstrate how wetlands in the County are recognized, mapped, and protected.

13. Why isn't the County's goal a better environment? Should not that be a goal at least as important as increased density, more mixed use, and less mitigation for impacts? Those goals of the TGPA may temporarily benefit a few, but how do they permanently benefit the county and it's present citizens?

14. Have you done any study or evaluation of an alternative plan that would save the rural atmosphere and the environment of El Dorado County while at the same time provide jobs and moderate-income housing?

15. Is environmental destruction and increased density, which requires mitigations that never truly mitigate for all that is lost, the only way that can be found to create new jobs and provide moderate-income housing?
You can not know the benefits of preservation unless you make it a goal and study it. I propose that you study an alternative plan to meet your goals. A plan that also has goals to improve the biological resources of the County, improve air quality, scenic vistas, rural atmosphere, wildlife habitat and all the other biological attributes that make life in El Dorado County so special. I propose that you study ways to achieve the goals of the TGPA without so many impacts that are "significant and unavoidable." Or change the goals.

E. WATER SUPPLY

Why does the Biological Resources section of the DEIR not include a water supply assessment by the local water district? The DEIR offers no information on future water supply for increased densities and mixed uses. It offers no alternative sources for acquiring water. It does not analyze the impact to current water district residents. There is no assurance at all that the current water supply can accommodate the projected increases in population densities. Especially during drought years, which may become the norm due to global warming.

1. How will the water supply of current residents be impacted by the proposed changes to the general plan and zoning ordinance? What studies have been done to assess the impact to current residents?
Please describe the studies and their findings in the appendix of the final EIR.
2. What studies have been done to assess how supplying water for new developments, and processing the discharge, including agricultural discharge, will affect biological resources?
Please include the studies and their findings in the appendix of the final EIR.

F. GROWTH-INDUCING IMPACTS

The Biological Section of the DEIR does not discuss growth-inducing impacts of

the proposed changes nor possible mitigations for growth-inducing impacts.

1. What studies were done to assess growth-inducing impacts of the TGPA? If none were done, why not?
2. How will those impacts affect biological resources?

G. TRAFFIC AND ROAD IMPACTS TO WILDLIFE

The DEIR does not address the impacts of increases in traffic and roads to wild plant and animal life.

1. How will increased traffic and more roads cutting across migration paths affect wildlife and plants?
2. Are wildlife corridors mapped?
3. How can you know what damage could be done if there has been no mapping of wildlife migration corridors or other important natural habitats?

H. DEVELOPMENT ON SLOPES GREATER THAN 30 PERCENT

1. What is the reason for the proposal to allow development on slopes greater than 30 per cent?

"Implementation of Mitigation Measure BIO-1a would reduce this impact to a less-than-significant level."

Mitigation Measure BIO-1a says, "Limit the relaxation of hillside development standards."

That does not make sense to me. It sounds like the TGPA proposes allowing development on slopes greater than 30 percent, but, if it is "limited," the impacts will be less than significant.

"Limited" is too vague and broad a word to really judge whether it can accomplish any sort of mitigation.

1. How does this proposed change to the General Plan benefit the citizens of El Dorado County?
2. How does it help create jobs?
3. How does it help supply moderate-income housing?

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4. Is this proposed change worth the potential impacts to the environment?

I. OPEN SPACE REQUIREMENT

"The intent and emphasis of the Open Space land use designation and of the non-disturbance policy is to ensure continued viability of contiguous or interdependent habitat areas and the preservation of all movement corridors between related habitats."

What is the reason for changing the requirement for retaining 30 percent of a project's land as open space?

"Proposed Amendment to Policy 2.2.3.1 (open space in –PD zones)
General Plan Policy 7.4.1.6 requires discretionary projects to avoid fragmenting habitat when feasible or to mitigate for the loss if avoidance is not feasible. Discretionary projects would also be subject to CEQA review that would specify the necessary mitigation in order to comply with this policy. This would be sufficient to protect habitat from fragmentation. The impact would be less than significant. "

This mitigation is insufficient. The policy is too vague and open to interpretation. How will this be enforced?

1. Why propose changing the definition of open space and the purpose of open space?
2. What is the reason for allowing private yards to be considered as 15 percent of open space?

I think if you polled the citizens of this county, most would not define open space as private yards. I certainly don't. Private yards do not guarantee how "open space" is retained or used. It also puts the costs of providing and maintaining open space on private citizens instead of on a project's developers.

3. What is the reason for allowing developers to pass their costs and obligations on to private citizens?
4. Why are you proposing eliminating "habitat use" as one of the uses of open space?
5. Why change the "requirement" for 30 percent open space to a "discretionary" 15 and 15 "set-aside?" It truly makes no sense.

6. Who does this amendment benefit? Does it help the citizens of El Dorado County? How? Does it ease traffic, retain open space, mitigate for loss of wildlife habitat, water resources, air quality? Does it maintain the rural atmosphere of a rural county?

J. MIXED USE

What is the reason for proposing to allow, in Agricultural, Rural Lands, and Resource zones, such uses as Off-Highway Vehicle Recreation Areas, lodging, health resorts, golf courses, and public utility service facilities? Or of allowing golf courses, Private Recreation Areas or Public Utility Service Facilities in rural residential areas?

1. Do you consider these uses compatible with a rural atmosphere, clean air, low noise, less pollution, more wildlife habitat, more open space, less traffic or less light pollution?
2. Would you want to live near an Off-Highway Vehicle Recreation Area if you lived in a rural area? People living in a "rural county" do not want these sorts of uses mixed in with the rural countryside.
3. How does this proposal help create well-paying, permanent jobs for EXISTING residents?
4. How does this proposal help create moderate-income, affordable housing?

This proposal, like most of those in this project, makes no sense.

K. AGRICULTURE EXPANSION AND EXEMPTIONS

Why is agriculture exempt from so many of the mitigations proposed? Agriculture can cause as much or more damage to the environment as any other sort of development. There is no reason why Agricultural projects cannot be required to mitigate for damage to wildlife habitat, streams, air quality, water quality, riparian habitat, tree canopy, migration corridors. An exemption for large sections of land can potentially do damage to contiguous habitat and migration corridors.

For example:

P. 169 "Horticultural and grazing projects on agriculturally designated lands are exempt from the restrictions placed on disturbance of natural areas when

utilizing "BMPs" recommended by the County Agricultural Commission and adopted by the Board of Supervisors when not subject to Policy 7.1.2.7."

P.172 Policy 7.4.4.4: "For all new development projects (not including agricultural cultivation and actions pursuant to an approved Fire Safe Plan necessary to protect existing structures, both of which are exempt from this policy) that would result in soil disturbance on parcels that (1) are over an acre and have at least 1 percent total canopy cover or (2) are less than an acre and have at least 10 percent total canopy cover by woodlands habitats as defined in this General Plan and determined from base line aerial photography or by site survey performed by a qualified biologist or licensed arborist, the County shall require one of two mitigation options: (1) the project applicant shall adhere to the tree canopy retention and replacement standards described below; or (2) the project applicant shall contribute to the County's Integrated Natural Resources Management Plan (INRMP) conservation
fund described in Policy 7.4.2.8."

1. How can you maintain wildlife corridors and maintain habitat continuity if large pieces of land are exempt from those mitigations?
The TGPA anticipates adding over 17,000 acres of ag-designated land. That is a lot of land that, if it is used for agricultural purposes, is inexplicably exempt from mitigating for environmental impacts. This makes no sense.

2. What are the impacts to the environment of allowing this much land to be potentially exempt from mitigations?

L. History of failure to follow policies and ordinances

One of the major mitigation measures proposed in the 2004 General Plan, the Integrated Resource Management Plan (INRMP) (discussed in a separate section in these comments), which was supposed to be completed within five years of the approval of the 2004 plan, has never been completed and implemented. That does not bode well for any mitigation measures that the county proposes. Nor does the County's interest in the importance of individual property rights over the policies and codes meant to protect the environment. According to a Grand Jury report, there is a history of the County ignoring or not enforcing its own policies and codes.

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FOR EXAMPLE:

From Lake Tahoe News, June 20, 2014

"The grand jury received multiple complaints about improper grading on private property that affected other properties. Investigation led the jury to conclude that there "was a pattern and practice of failing to comply with the county Grading Ordinance."
The ultimate finding was, "The county's failure to enforce its Grading, Erosion and Sediment Control Ordinance encourages illegal grading to the detriment of other property owners and residents."
This does not include damage to biological resources caused by "improper" grading. How does the County mitigate for these past failures?

FROM the State Department of Conservation, SMARA (Surface Mining and Reclamation Act) newsletter dated April-June 1998:

"El Dorado County refused to enforce its own mining ordinance."
"We regret that these associations (involved on the side of El Dorado County in a law suit) are defending a serious, long-term SMARA violator, and the county with the worst SMARA compliance record in the state."

This refusal eventually led to El Dorado county being sued:

(The mine owner) "…hastily had 'reclamation plans' prepared, plans that fell far short of meeting SMARA minimum requirements. The El Dorado County Planning Commission approved these documents, in spite of department and local citizen testimony that they were woefully inadequate. (Emphasis added.) Upon appeal to the board of supervisors, that body, faced with the same evidence of failure to meet SMARA requirements, decided to support (the mine owner). Given these actions, the department was faced with either accepting patently inadequate reclamation plans, prepared and approved only to avoid closure, or taking the unprecedented step of suing the county to require preparation of adequate plans. After much thought and consideration, the department sued."
This suit took years and many twists and turns to be resolved, eventually, by the State Supreme Court. The decision was not in favor of the County's

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position. Here is more on this case:
"El Dorado County decided to process inadequate CEQA documents and a reclamation plan for a mine on which they had yet to make a decision if there was even a right to operate. Six months after approving the reclamation plan questions and complaints from concerned residents on the unauthorized expansion of the Diamond Quarry, and the effect on it's "vested" status, were simply disregarded by the county. Faced with this evidence of the county ignoring the SMARA requirement that mines must have permits before operating, not to mention its own land-use ordinances, it became clear that the county did not take its lead agency responsibilities to the public seriously."
From: http://caselaw.findlaw.com/ca-supreme-court/1243136.html
"If the reclamation plan does not require the operator to reclaim the site in accordance with SMARA, accomplishment of SMARA's goal of protecting public health and safety, as well as the environment, is at risk. And if the operator's financial assurances are inadequate to accomplish the reclamation plan, taxpayers are at risk of bearing the burden. "
- See more at: http://caselaw.findlaw.com/ca-supreme-court/1243136.html#sthash.J5FK3n4d.dpuf

Supreme Court of California
The PEOPLE ex rel. DEPT. OF CONSERVATION et al., Plaintiffs and Appellants, v. EL DORADO COUNTY et al., Defendants and Respondents; Loring Brunius, Real Party in Interest and Respondent; California Mining Association et al., Interveners and Respondents.
No. S116870.
Decided: August 8, 2005
- See more at: http://caselaw.findlaw.com/ca-supreme-court/1243136.html#sthash.J5FK3n4d.dpuf

The above statements about the county refusing to obey its own ordinances as well as not meeting state requirements and goals for protecting the environment (including air quality and asbestos release) and not keeping taxpayers from being burdened with reclamation costs, are truly disturbing. What are the citizens of El Dorado County to think about the value and validity of any Policies, Ordinances or mitigations?

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1. Can the public trust any of the mitigations proposed in the DEIR? The DEIR states: (Under "2004 General Plan EIR conclusions")

"Assuming that the County successfully develops and enforces the measures in the implementation program related to habitat protection, impacts could be reduced further through mitigation. However, the degree to which the implementation measures and policies would offset impacts on wildlife habitat is difficult to predict."
"In general, the policies serve more to guide the County in minimizing impacts when feasible methods exist than to ensure protection. Mitigation to ensure no net loss of important habitat would be developed, but there are no current assurances that implementation of such mitigation would be required by the County."

The above statement, together with the above examples, does not give me any confidence in the County's proposed mitigation measures.
2. What kind of assurance can you give that mitigation measures will be developed and strictly followed?
3. Are there proposed means for monitoring and enforcing mitigations?
4. Specify the sort of monitoring and enforcing that will be used. How long will it last?
5. Who will pay for monitoring, maintenance and enforcement of mitigation measures?
6. If a fund is proposed, how will the money be collected and distributed?
7. How will you assure that there is enough money to cover the costs of mitigations?

Mitigation measures must not only sound good on paper, they must be developed, put into use, rigorously practiced, and enforced as if they are the law, not just rules to interpret as one sees fit. If they are only guidelines with no teeth in them, then that should be stated in the DEIR.
8. Are the mitigation measures in the DEIR Just meant as guidelines?
If so, where is that stated? If not, how are the mitigations meant to be used, followed, and enforced? What assurance is there that the mitigations will actually work, let alone be put into action?
The DEIR cannot state that this or that mitigation will reduce impacts to "less than significant" if those mitigations are never put into practice. This should be disclosed in the final EIR.

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M. INTEGRATED RESOURCE MANAGEMENT PLAN

The most important (proposed) document in the 2004 General Plan pertaining to wildlife conservation, environmental impacts, and mitigations is the Integrated Resources Management Plan (INRMP). This plan was to identify "important habitat in the County" and establish "a program for effective habitat preservation and management." It was to be completed within five years of the adoption of the 2004 plan. It has never been completed or implemented.
Have any of the following (proposed) parts of the INRMP been put into action:

A. "Habitat Inventory," to be updated every three years. How can it be updated if it has never been done?

1. Has a "habitat inventory" been done? If not, when will one be completed? Who will conduct the inventory?
2. How will the areas to inventory be chosen?
3. How will an inventory be paid for?
4. How will an inventory be updated and maintained?
5. How will an inventory be used in future planning and mitigations?

B. "Habitat Protection Strategy"

1. Does a strategy "for protecting important habitats based on coordinated land acquisitions" exist?
2. What are the details of this strategy?
3. How does the strategy identify lands to be acquired?
4. Has any land been acquired?
   How much land has been acquired?
   Where is the acquired land?
   How was the land acquired? Was it purchased? What funds were used to purchase the land?
   How is the land being protected?
5. Is there a management strategy for acquired land?

"The goal of the strategy shall be to conserve and restore contiguous blocks of important habitats to offset the effects of increased habitat loss and

fragmentation elsewhere in the county"

6. Have any contiguous blocks of important habitat been conserved or restored? Where? How were they conserved or restored? How was it paid for?

7. Has this management strategy been updated at least every five years, based on the "habitat monitoring program?"

8. How is "important habitat" determined?

C. "Mitigation Assistance"

1. Has a program been established "to facilitate mitigation of impacts to biological resources resulting from projects approved by the County that are unable to avoid impacts on important habitats?"

2. What are the details of this program?

3. Have "mitigation banks" been developed?

4. Have lists of potential mitigation options been maintained? What options are listed? How are the options determined? Are studies done to determine what options are available and which should be used?
Please include any studies and findings in the appendix of the final EIR.

5. Are there incentives for developer and landowner participation in the habitat acquisition and management components of the INRMP? What are the incentives? How were the incentives developed? When are the incentives used? Have incentives been used for habitat acquisition? Or for managing and maintaining habitat? What habitat?

6. Is there a "mitigation bank?" What does it contain? How was it obtained? Are there criteria to determine when a developer must deposit funds into the mitigation bank? What are they? Are there criteria to determine how much a developer must contribute? What are they?

7. How is the mitigation bank used? Has it been used to mitigate any impacts? If so, what impacts? Were they fully mitigated? How were they mitigated?

D. "Habitat Acquisition"

1. Is there a program for habitat acquisition as described in the INRMP? Have lands been acquired? How were the lands paid for?

2. Have any lands been acquired in fee or protected through acquisition of a conservation easement? Are there any conservation easements? Where are they? How are they maintained and managed?

3. Is there a program to identify opportunities for partnerships between the County and other organizations for habitat acquisition and management? Where is that program? What does it contain?

E. "Habitat Management"

"Each property or easement acquired through the INRMP should be evaluated to determine whether the biological resources would benefit from restoration or management actions."

1. Have any acquired properties or easements been evaluated?
2. Have evaluations determined whether any biological resources would benefit from restoration or management? Who did the evaluations? What were the evaluations based on? What resources have been identified? Where are they located? How are they identified? Have any been restored? How are they restored? Who decides what habitats to restore and how to restore them? How are they managed? Who manages them? Who pays for management?

F. "Monitoring"

1. Is there a "habitat monitoring program" in the INRMP?
2. Has habitat monitoring been incorporated into future County planning efforts "so as to more effectively conserve and restore important habitat?"
3. Has there been any "special-status species" monitoring? What species have been monitored? Where were they monitored? How were they monitored? Who monitored them? Who paid for monitoring?
4. Has the monitoring been reported to the CNDDB?
5. Have the monitoring results been compiled into an annual report presented to the Board of Supervisors?

Please include the monitoring results in the appendix of the final EIR.

G. "Public Participation"

1. How has the public participated in the development of the INRMP?
2. Have local, state, and federal agencies having jurisdiction over natural resources within the County been consulted?
3. What agencies were consulted? Where are the results of these consultations? What decisions were made?
4. How have the consultations been used or incorporated into the INRMP?

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H. "FUNDING"

1. Has a conservation fund been developed to adequately fund the INRMP? If there is a conservation fund, but no INRMP, what is the fund used for?
2. Does the fund include money for habitat maintenance and restoration?
3. What is the source of the funds?
4. Have any mitigation fees been paid into a conservation fund? How much was paid? How was the cost determined? What criteria were used to determine the amount to be paid?
5. What were mitigation fees used for?
6. What has the Conservation Fund been used for? What criteria are used to determine how the fund is used?
7. Have any grants been applied for or obtained? How much was attained? What was it used for?
8. Is there any money set aside in the general fund to provide funding for the requirements in the INRMP?
9. How much money is set aside? If none is set aside, why not?
10. How much money is in the Conservation Fund?
11. How much of the fund has been used for meeting the requirements of the INRMP?
12. How has the fund been used?
13. Where have funds been used?
14. Have any project developers been required to pay for all mitigations needed because of their project? Which developers have paid? How much has been paid? Which projects were mitigated? Were they fully mitigated?
15. Are funds set aside for continued maintenance, management, and restoration of habitats that are part of the INRMP?
16. Have any INRMP annual reports been created? Where are those reports? How have they been used?
17. How can development continue without all the promised mitigation measures in place?
18. How can one trust a document (and the creators of that document) stating that a mitigation measure will be in place within five years of the General Plan going into effect, then not actually have that mitigation measure in place?
19. Since development has continued over the years that the INRMP was supposed to be in place, how were impacts that would have been lessened by the INRMP been mitigated?
20. How much damage to biological resources has already occurred because

the INRMP has not been in place as required? How is that damage quantified?

21. How will you mitigate for biological resource degradation that has occurred because the INRMP has not been in place?
The environmental mitigations should be in place BEFORE development is allowed, not AFTER.
22. Have wildlife corridors and habitat continuity be destroyed during the time that the INRMP was supposed to be in place, but was not? What corridors were interrupted? What habitat continuity was disrupted?
23. Has this disruption caused irreparable harm to these corridors and habitat continuity?
24. How can you mitigate after the fact for loss of or damage to irreplaceable wildlife habitat?

M. MITIGATION MEASURES

Most of the mitigation measures proposed do nothing but leave the impacts in the hands and discretion of future planners and future policies. Mysteriously, future codes and zoning and regulations are supposed to fully mitigate for extreme actions like development on grades steeper than 30 percent. There is absolutely no guarantee that this is a mitigation, let alone an adequate mitigation. Mitigations should be specific and specifically stated so that they can be evaluated on their merit, not left vague and up to nebulous future practices. There is no way to evaluate whether this is adequate or appropriate mitigation.

N. COMMENTS

Overall, this proposal and this DEIR are a flimsy attempt to increase density, allow mixed uses, and lower mitigation requirements to the detriment of the citizens of El Dorado County and its environment and rural character.

my comments on DEIR.wps
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TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Comments on TGPA/ZOU Draft EIR

1 message

Langley, Cheryl@CDPR <Cheryl.Langley@cdpr.ca.gov> Mon, Jul 21, 2014 at 5:03 PM
To: "TGPA-ZOU@edcgov.us" <TGPA-ZOU@edcgov.us>

Dear Ms. Purvines--

Attached are my comments on the TGPA/ZOU draft EIR. Please confirm receipt of the file (11 pages) before the July 23, 2014 deadline, if possible.

Thank you!

Cheryl Langley

Biological Resources.July21.2014.docx
58K

Cheryl Langley
5010 Mother Lode Drive
Shingle Springs, CA

Date: July 21, 2014
Subject: Review of the TGPA/ZOU Draft Environmental Impact Report

I reviewed El Dorado County's (EDC) Targeted General Plan Amendments/Zoning Ordinance Update (TGPA/ZOU) draft Environment Impact Report (dEIR) and have the following comments.

(1) The basic approach of the dEIR is flawed.

Page 3.4-21 states: "*This DEIR analyzes whether these proposed changes…would not be reasonably foreseeable under the existing General Plan and Zoning Ordinance."*

AND

Page 3.4-25 states: *"Each of the impact discussions…first discloses the extent to which the current General Plan…has or is expected to have an impact on biological resources. The potential effects of the project on existing biological resources are then analyzed."*

AND

Page 3.4-25 states: "*The 2004 Final EIR for the General Plan modified these considerations [CEQA thresholds of significance] to reflect the character of El Dorado County. The present DEIR will use the following considerations taken from the 2004 General Plan EIR to evaluate impacts…"*

Because the dEIR takes the 2004 General Plan as a "starting point" from which to evaluate the impacts of the newly proposed TGPA/ZOU policies, the result is an inappropriate assessment of new policy impacts. To be a legally appropriate document, the dEIR must compare the outcome of the proposed policies (the project) with ***existing*** physical conditions; that is, courts have required that the baseline of an EIR reflect physical conditions at the ***start of environmental review*** (*EPIC v. County of El Dorado [1982]*).[1] Using conditions that were present when the General Plan (a ten-year old document) was prepared and approved is inappropriate.

(2) Many of the mitigation programs described in the 2004 General Plan have not been implemented.

Page 3.4-5 states: "*The County 2004 General Plan contains numerous goals and policies intended to conserve biological resources."*

Despite the fact that many of the mitigation measures (including *programs* intended to mitigate adverse effects of development) described in the 2004 General Plan have not been established, **the TGPA/ZOU dEIR is working under the assumption that these mitigations have been implemented and are efficacious**; this is erroneous. The dEIR should "start from scratch." It should clearly identify mitigation programs that are currently in use (and shown to be effective mitigation elements), and reestablish

[1] **EPIC v County of El Dorado (1982) held:** "*The dispositive issue…is whether the requirements of CEQA are satisfied when the EIRs prepared for use in considering amendments to the county general plan compare the environmental impacts of the proposed amendments to the existing plan rather than to the existing environment. We hold that the EIRs must report on the impact of the proposed plans on the existing environment." Discussion available at: http://resources.ca.gov/ceqa/cases/1982/el_dorado_043082.html*

timelines for yet to be developed programs. Mitigation measures under development need to be well researched and—to the degree possible—their efficacy established through investigation into programs implemented elsewhere in the State, and/or evaluated and recommended by research institutions, including universities and State departments with expertise in the areas of concern. **The efficacy of established and proposed programs needs to be documented and presented in the dEIR.**

These programs/mitigation measures **must be in place** prior to allowing TGPA/ZOU development policies to move forward (e.g., increases in zoning densities, changes to allowable activities in Agricultural Districts, etc.)

Please provide information on the following programs/studies/ mitigation measures/strategies, databases, etc., in an appendix to the final EIR. Identify: 1) specifically how the programs, etc. function to mitigate the impacts they are designed to reduce; 2) the programs, etc. that have been established and implemented (include efficacy evaluations); 3) the programs, etc. that have not been developed, the progress made toward development, the anticipated completion date, and documentation upon which development will be based; 4) the programs, etc., that include monitoring and reporting components; 5) the timing/duration of monitoring and reporting components, if applicable; and 6) any penalties imposed (and/or project adjustments required) for noncompliance with mitigation responsibilities (short and long-term).

a. Integrated Natural Resources Management Plan (INRMP) (CO-M; page 3.4-13)
b. Important Biological Corridor (-IBC) Overlay (review and update; page 3.4-13)
c. Oak Tree Preservation Ordinance (page 3.4-11)
d. Biological Resources Study (CO-U, A; page 3.4-14)
e. Biological resource evaluation (if different than Biological Resources Study [d]) (page 3.4-28)
f. Important Habitat Mitigation Program (CO-U, B; page 3.4-14)
g. *County guidelines for off-site mitigation* of impacts to biological resources (page 3.4-14)
h. Erosion and Sediment Control Plan (page 3.4-23)
i. *Development standards* for hillside development (page 3.4-24)
j. *Conservation fund* to acquire and protect important habitat (CO-U; 3.4-13)
k. Ecological Preserve Fee Program (Policy 7.4.1.1; page 3.4-14)
l. Zoning Ordinance's in-lieu fee option (page 3.4-14)
m. Rare Plant Mitigation Program (page 3.4-15)
n. Riparian/wetland setbacks and "proposed code,"(page 3.4-6 & 3.4-28)
o. Conservation easements (page 3.4-6)
p. Natural Resource Protection Areas (page 3.4-6)
q. No-Net-Loss Policy (CO-U8; page 3.4-27)
r. Species, habitat, and natural community preservation/conservation strategies (page 3.4-6)
s. Natural Resources Management Plan Conservation Fund (If different than [j]) (page 3.4-12)
t. State Land Conservation Act Program; describe how EDC will "*provide for Open Space through local implementation*" of this program (page 3.4-13)
u. Habitat Protection Strategy (if different than [f]) (page 3.4-8)
v. Ecological Preserve overlay (page 3.4-5)
w. Database of important surface water features (page 3.4-6)
x. Important Biological Resources Map (page 3.4-7)
y. Biological Community Conservation Plans (page 3.4-7)

For each of the programs that have been implemented, please provide the following documentation in an appendix to the final EIR:

- Identify specific EDC development projects that have been required to implement mitigation programs, and identify which mitigation measures were implemented.
- Provide monitoring results from follow-up mitigation efficacy investigations, and name the specific development project(s) that were investigated.
- Identify the individual/agency/department/etc. responsible for evaluating the effectiveness of mitigation, and provide their credentials (relative to evaluating mitigation of environmental impacts).
- Provide documentation on specific (named) projects from which mitigation fees have been collected, identify the program under which they were collected, quantify the amounts collected, and what the fees were used for.

Please explain the following statements (A) and (B):

(A) "*Mitigation to ensure no net loss of important habitat would be developed, but there are no current assurances that implementation of such mitigation would be required by the County."* (page 3.4-26)

(B) "*There are no habitat conservation plans or natural community conservation plans in El Dorado County (U.S. Fish and Wildlife Service 2013; California Department of Fish and Wildlife 2013). Therefore,[there would be no] conflict with any such plan and there would be no impact."* (page 3.6-9)

- Is it likely the "lack of mitigation enforcement" eluded to in **(A)** would also apply to any or all of the proposed biological resources mitigation measures listed in **(2)** above? If so, under what circumstances?

- Does the statement *"[t]here are no habitat conservation plans…in El Dorado County*" **(B)** mean the conservation strategies and plans, conservation easements, etc., identified on page 3.4-6 are null and void?

(3) The mitigation proposals presented in the dEIR are "hollow."

While many of the mitigation proposals presented in the dEIR sound well established, closer inspection yields a different picture. <u>For example, tracing the thread of discussion on development of hillsides ≥30% yields the following information</u>.

Page 3.4-33: Mitigation Measure BIO-1a: Limit the relaxation of hillside development standards

Revise proposed Policy 7.1.2.1 and Section 17.30.060, subsections C and D, as follows.

*Development or disturbance of slopes over 30% **shall be restricted**. Standards for implementation of this policy, including but not limited to a **prohibition on development or disturbance where special-status species habitat** is present and exceptions for access, **reasonable use of the parcel**, and **agricultural uses** shall be incorporated into the Zoning Ordinance.*

Section 17.30.060, subsection C. Development Standards applicable to slopes 30 percent or greater.

*Development shall be **prohibited** where ground disturbance would adversely affect important habitat through conversion or fragmentation and shall comply with the provisions of General Plan Policy 7.4.1.6 regarding **avoidance** of **important habitats**. In order to demonstrate that adverse effects on important habitat will be avoided, **the development proponent** shall submit an independent **Biological Resources Study, to be prepared by a qualified biologist**, which examines the site for important habitat consistent with General Plan Implementation Measure **CO-U.***

Reviewer Comments on this portion of the mitigation proposal:

- Mitigation is described in broad terms, such as "*shall be restricted.*" This does nothing to identify how activities will actually *be* "restricted."
- "*Avoidance*" is not quantified or defined.
- "*Important habitats*" is not defined. (According to the 2004 General Plan, "important habitats" will not be defined until the INRMP is developed.)
- The term "*prohibited*"—in this context—is narrowly defined; special-status species is a high bar, and exceptions ("*reasonable use of parcel*," "*agricultural uses*," etc.) are included even in the presence of special-status species. (Who decides what "reasonable use" is?)
- The fact that the development proponent is responsible for hiring the biologist that performs the Biological Resources Study is problematic. The question of the potential "bias" of a report prepared by an individual hired by the developer to evaluate the developer's project will always loom large.
- Biological Resources Studies have not been performed, and the criteria for these studies have not been developed. Furthermore, it is not known *when* study criteria will be developed, or how effective the studies will be in evaluating project impacts. Because the studies will be performed by different biologists who are not required to consult with independent experts or with agencies with expertise in environmental issues (such as riparian/steam protection, wildlife requirements, etc.), the studies are likely to be inconsistent, and highly dependent upon the relative expertise of each biologist.

Again, following the thread to General Plan Policy 7.4.1.6. Page 144 of the 2004 General Plan states:

Policy 7.4.1.*6 All development projects involving discretionary review shall be designed to **avoid disturbance or fragmentation of important habitats to the extent reasonably feasible.** Where avoidance is not possible, the development shall be required to **fully mitigate** the effects of important habitat loss and fragmentation. Mitigation shall be defined in the **Integrated Natural Resources Management Plan (INRMP**) (see Policy 7.4.2.8 and Implementation Measure CO-M).*

*The County Agricultural Commission, Plant and Wildlife Technical Advisory Committee, representatives of the agricultural community, academia, and other stakeholders shall be involved and consulted in defining the **important habitats** of the County and in the **creation and implementation of the INRMP.***

Reviewer Comments on this portion of the mitigation proposal:

- "Avoidance" is once again not defined.
- "Important habitats" is not defined.

- The term "reasonably feasible" is a red flag for "wiggle room." (Who determines what is "reasonably feasible"?) Without pre-determined mitigation standards, "reasonably feasible" is purely subjective.
- How do you "*fully mitigate*" something where "a*voidance is not possible*"? (How is this accomplished, and who determines how to accomplish mitigation?) "Full mitigation" would require that the site be left undisturbed.
- The Integrated Natural Resources Management Plan (INRMP) has not been established. According to the 2004 General Plan, it was to be developed within five years of General Plan approval (page 146, 2004 General Plan). Because the plan has not come to fruition, EDC's mitigation program for "…*effective habitat preservation and management*" remains undefined.
- The Plant and Wildlife Technical Advisory Committee—to be established under the INRPM—is described as a Committee that "…***should** be formed of local experts, including agricultural, fire protection, and forestry representatives, who will consult with other experts with special expertise on various plant and wildlife issues, including representatives of regulatory agencies*." What assurance is there that the Committee *will* be formed by local "experts," or that members will consult with experts? Is it realistic to assume someone from fire protection (or agriculture or forestry, for that matter) has expertise in the area of wildlife issues?
- Policy 7.4.2.8 and CO-M refer to the non-existent INRMP.

Again, following the thread to General Plan mitigation measure CO-U; page 144 of the 2004 General Plan states:

> MEASURE CO-U
> *Mitigation under Policy 7.4.1.6 shall include providing **sufficient funding** to the County's **conservation fund** to acquire and protect important habitat at a minimum 2:1 ratio. Impacts on important habitat and mitigation requirements shall be addressed in a **Biological Resources Study and an Important Habitat Mitigation Program (described below).***
>
> ***A. Biological Resources Study.** The County **shall adopt biological resource assessment standards** that apply to all discretionary projects that would result in disturbance of soil and native vegetation in areas that include **important habitat as defined in the INRMP.** The assessment of the project site must be in the form of an independent **Biological Resources Study,** and must be completed by a qualified biologist.*
>
> ***B. Important Habitat Mitigation Program.** The **Biological Resource Study** shall include an Important **Habitat Mitigation Program** that **identifies options that would avoid, minimize, or compensate for impacts on important habitats in compliance with the standards of the INRMP** and the General Plan.*

Reviewer Comments on this portion of the mitigation proposal:

- Because the INRMP, Biological Resources Study, and Important Habitat Mitigation Program have not been established, mitigation measure CO-U is a non-starter.

(4) Protections for Open Space are inadequate.

The exemptions and modifications to Open Space protections are numerous. Open space—the element that defines EDC's rural character—is not protected under the proposed policies. "Rural character" is a finite resource; it is the unique feature that EDC has to offer both current and future residents, and

visitors to the County. The 2004 General Plan identified this attribute as worthy of protection when it states that the goal of its policies is to, *"Maintain and protect the County's natural beauty and environmental quality, vegetation, air and water quality, natural landscape features, cultural resource values, and maintain the rural character and lifestyle…"* The policies proposed under this dEIR will erode Open Space protections, and change the character of EDC through the following proposals:

- exempt some development projects from the 30% open space requirement while allowing others to provide 15% in recreational/landscaped buffers and 15% in private yards;
- eliminate the provision that open space may be kept as *wildlife habitat*, instead providing that it may be maintained in a *natural condition*;
- allow development in specific areas (Community Regions and Rural Centers) and allow a lesser area of "*improved open space*;"
- provide open space off-site or by an in-lieu fee option (with actual off-site land acquisition, and acquisitions under fee program unidentified);
- provide "*exemptions and alternatives*" to open space to facilitate and encourage higher density housing developments;
- allow planned developments within Agricultural Districts to set aside open space for agricultural uses such as "*raising and grazing animals, orchards, vineyard, community gardens and crop lands*;" and
- include infrastructure, including roads, water, wastewater, drainage facilities and other utilities within Open Space Zones.

Please include in an appendix to the final EIR the following information:

- Why—given the obvious magnitude of the Open Space policy changes—the dEIR concludes that, "*…the TGPA and the related changes in the ZOU would not result in a significant environmental effect. This impact would be less than significant."*
- Explain how the in-lieu fee option works—if it has been used—and if it has been used, what funds have been collected and what they have been used for.
- Explain what is meant by "*eliminate the provision that open space **may** be kept as wildlife habitat, instead providing that it may be maintained in a natural condition."*
- Explain how *"natural condition"* differs from *"wildlife habitat"* in the context of this new policy.
- Describe what is meant by *"improved open space."*
- Identify where open space might be provided "off site." Identify where this has been done in the past (if it has), where the open space is, and identify and describe what policies protect it from future development.
- Explain why infrastructure and agricultural uses (orchards, etc.) will be classified as open space.

(5) Riparian/wetland setbacks for ministerial projects are too small; discretionary project setbacks remain undefined, with no minimums.

Page 3.4-28 states: ***"Ministerial development*** *would be required to be set back 25 feet from any intermittent stream, wetland or sensitive riparian habitat, or a distance of 50 feet from any perennial lake, river, or stream. All* ***discretionary development****… would require a* ***biological resource evaluation*** *to establish the area of avoidance and any buffers or setbacks required to reduce the impacts to a* ***less-than-significant level*** *(this would be in addition to any required CEQA analysis). Where* ***all impacts*** *are not reasonably avoided, the biological resource evaluation would be required to identify mitigation measures that* ***may*** *be employed to* ***reduce the significant effects****. The* ***proposed code*** *would also establish greater setbacks from specified major lakes, rivers, and creeks within the county."*

It is not clear from this description exactly what will be accomplished under the biological resource evaluation. The evaluation is described as a tool to identify setbacks that will reduce impacts to a "less-than-significant level," but where *all impacts* (***less*** than "less-than-significant"?) are not reasonably avoided, the evaluation would identify mitigation measures that "may" be employed to "reduce" significant effects. Then a "proposed code" is mentioned. So—what is the mitigation mechanism—the biological resource evaluation, or a yet-to-be-developed "code"?

The language in the dEIR does nothing to identify what **real** protection is being established for riparian/wetland habitat under discretionary projects. Where impacts "are not reasonably avoided," measures **may** be employed to reduce impacts, but clearly, these measures—as implied by the term "*may*"—need *not* be employed. Theoretically, EDC should have more flexibility to enforce setbacks under discretionary projects than under ministerial projects, and yet a standard has been set for ministerial projects (albeit inadequate to protect riparian/stream resources), but no setback has been established for discretionary projects.

Because the biological resource evaluation would be conducted by a biologist hired by the developer (with potentially as little expertise as is acquired with a BA degree in biology), it is doubtful the biologist would have the expertise necessary to effectively evaluate riparian/stream setback requirements. The biologist would need to consult with experts (research institutions, State agency personnel with field experience, etc.) to produce an effective evaluation. Consultation is crucial; effective buffers need to be based on science, not on the wishes of the developer.

Please provide in an appendix to the final EIR:

- **The scientific basis upon which riparian/stream setbacks were/will be developed (such as peer-reviewed research documents, studies from universities, reports from State agencies with expertise in riparian/stream protection).**
- **How/why the criteria for ministerial projects will differ from the setback for discretionary projects, given a hypothetically equivalent environment in each case.**
- **The criteria used to determine both the impacts/mitigations for discretionary development projects and the setback size(s) for discretionary projects.**
- **Information on the "biologist" that will perform the evaluations, including who will hire the biologist (the project developer, etc.) Include a discussion about whether an additional environmental review should be conducted post-project approval under contract with a research institution or State agency.**
- **A synopsis of what will be required in the biological resource evaluation, including whether the biologist will be required to consult with agencies with expertise in the field of riparian/stream protection, wildlife protection, etc., and be required to include information from such consultations in the report.**
- **Information on short- and long-term monitoring and reporting requirements for both ministerial and discretionary projects. (If they will be conducted, who will conduct them, and the qualifications of individuals conducting the monitoring.)**
- **Any penalties or corrective actions that will be required for violations to prescriptive mitigations, and the criteria upon which these actions will be based.**
- **Identify actions that will be taken to revise ordinances and policies if mitigation measures established in "code" are found not to be effective.**

(6) The "Environmental Setting"—beginning on page 3.4-15—is cursory at best and therefore understates the rich plant/animal communities present in EDC; some "special-status species" are not listed.

The description of EDC's plant/animal communities woefully understates the rich diversity present in the County. This "omission" could lull some reviewers into believing there is "really not much to lose," if we edge wildlife/wildlife habitat out as EDC "grows," and that the multiple environmental mitigation measures cited in the dEIR are more than adequate to protect the few biological resources mentioned. This, of course, would be a serious misperception; but it is one easily deduced from the limited representation of biota in this dEIR.

To complicate matters, the list of "special-status species" is incomplete. (It needs to be clarified—if it is indeed the case—that species to be protected via environmental mitigations include more than endangered, rare, or threatened species; included are *fully protected animals,*[2] *special animals,*[3] and nesting habitat for specific species, etc.) But because this list of "special-status species is incomplete, these animals (and nesting habitats) are probably not protected, and it is doubtful protections will be applied to ensure either their survival or the protection of their habitat if they are not recognized. For instance, Table 3.4-2 does not include some "special-status species" that the reviewer knows occur in EDC:

- The list does not include two *fully protected animals* that are EDC residents, the white-tailed kite (*Elanus leucurus*) and ring-tailed cat (genus *Bassariscus*).
- Nesting colony protection[4] for great blue heron (*Ardea Herodias*), and snowy egret (*Egretta thula*), white-tailed kite (*Elanus leucurus),* great gray owl (*Strix nebulosa*), Nuttall's woodpecker (*Picoides nuttalli*), and oak titmouse (*Baeolophus inornatus*) is not included.

(NOTE: This is by no means a complete list of animals/habitats that were overlooked; these are simply notes on what was easily recognized as omissions by a non-expert resident that has lived in EDC for a few years.) The fact that "fully protected" and "special animals" and their habitat requirements are not identified in the dEIR is an oversight that speaks volumes about the lack of analysis performed to establish these lists. Because this analysis has bearing on what is protected under mitigation activities, it needs to be amended/corrected by experts with appropriate credentials.

Section 15380 of the California Environmental Quality Act (CEQA) Guidelines clearly indicates that species of special concern (including "*fully protected*" and "*special animals*") should be included in the analysis of project impacts. Sections 15063 and 15065 are particularly relevant to species of special concern. (In assigning "impact significance" to populations of non-listed species, analysts consider factors such as population-level effects, proportion of the taxon's range affected by a project, regional effects, and impacts to habitat features.)[5]

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[2] California Department of Fish and Wildlife. 2014. *Fully Protected Animals*. Available at: https//dfg.ca.gov/wildlife/nongame/t_e_spp/fully_pro.html.

[3] Department of Fish and Game. 2011. *Special Animals*. Biogeographic Data Branch, California Natural Diversity Database. January, 2011.

[4] *Ibid*.

[5] California Department of Fish and Wildlife. 2014. *Fully Protected Animals*. Available at: https//dfg.ca.gov/wildlife/nongame/t_e_spp/fully_pro.html.

(7) Changes to agricultural zoning are not presented in an understandable manner; biological resources are not adequately protected under proposed policy changes.

The rationale behind the changes in zoning for Agricultural Districts—including changes to the roll-out zoning of Williamson Act lands—is not described in terms that enable the reviewer to understand what is accomplished as a result of these changes, or how the changes might impact the character of EDC and its natural environment. The discussions that *are* presented are disjointed, and make getting a grasp on the picture of the change—and its associated impact—impossible.

The discussion on impacts to wildlife habitat as a result of agricultural expansion is equally confusing:

Page 3.4-28 states: "*The 2004 General Plan EIR raised the concern that "[a]gricultural expansion has the potential for far greater impacts on the extent and connectivity of habitat than residential development, as a greater area of land in larger contiguous patches is generally more greatly disturbed."* ***However, land conversion data from the FMMP does not support this concern.*** *The conversion data for the three most recent reporting periods indicate that the amount of Other land converted to Agricultural was far outweighed by the amount of Agricultural land that converted to Other lands. The Other land category is not limited to wild land habitats as it also includes rural residential uses. Agricultural land that has been converted to Other land most probably became rural residential or other nonwild land land-use type. A certain amount of wild land habitat is being converted to agricultural use, but the amount is small, as shown in Table 3.4-4."*

Data from the Farmland Mapping and Monitoring Program (FMMP) neither support nor refute the concern that agricultural expansion has a greater potential to impact habitat connectivity than residential development. In fact—especially in light of the type of expansion proposed in Agricultural Districts under this dEIR—agricultural expansion will have a significant impact on wildlife habitat, especially because many of the mitigation measures that apply to residential development will not apply in Agricultural Districts (e.g., disturbance of natural areas, such as riparian/stream habitats, development on slopes ≥30%, on-site grading, Important Biological Corridor restrictions, etc.). That is not to say the impact on wildlife habitat will be *less* in areas of residential development than in Agricultural Districts, but in truth, this argument is specious; what is the value—and meaning—of such a discussion? Is it intended to persuade the reviewer that letting Agricultural Districts "off the hook" for impacts to wildlife and wildlife habitat is an acceptable trade-off for benefits that might be gained from agricultural expansion?

This discussion is particularly odd because close examination of the data source for Table 3.4-4 makes the reviewer wonder why the author of the table chose to present those specific data. The summary table from the Department of Conservation (DOC) shows that between 2008 – 2010 EDC's inventory of agricultural land declined by 1,742 acres, and "Other Land" (low-density residential) plus urban gained 1,513 and 75 acres, respectively, or 1,588 acres total from the ledger of agricultural land.[6] It is not clear why the (104 agricultural land/1,808 other land) data was used instead. In any case, it is not at all certain what this discussion (including the table) adds to the dEIR in terms of elucidating the relative impact of the expansion of agricultural land on wildlife and wildlife habitat.

If a discussion of relative impacts *is* to be had, it ought to include a discussion of the "addition" of 17,241 acres to Agricultural Districts, the expansion of new, allowable uses and activities in these Districts, and

[6] California Department of Conservation. *California Farmland Conversion Report.* April, 2014. http://www.conservation.ca.gov/dlrp/fmmp/Documents/fmmp/pubs/2008-2010/fcr/FCR%200810%20complete.pdf

exemptions from environmental protections—but it does not. This makes the data presented in the table all the more confounding. It is "information" that serves only to add volume to the report, without adding meaning and clarity.

Please include in an appendix to the final EIR:

- A description of each of the current agricultural zones, what they will be changed to, and what this means in terms of how the land can or will be used in the future. Compare new uses to "old" uses.
- A description of why these changes are beneficial/necessary.
- Describe what it means, exactly, for Williamson Act lands to roll out into a new zoning classification as opposed to the past zoning roll-out designation for these lands (in terms of impact to agriculture, open space, wildlife habitat, etc.)
- Describe why Agricultural Districts are being allowed exemptions for disturbance of natural areas (riparian/stream habitats, etc.), development on slopes ≥30%, on-site grading, Important Biological Corridor restrictions, etc. Who benefits from these exemptions?
- Identify where the 17,241 acres "came from." That is, discuss what this land was zoned prior to its inclusion in Agricultural Districts, and how this change will impact EDC's biological resources and the viability of agriculture in EDC.

(8) Enforcement of Ordinances called into question.

A recent article in the Mountain Democrat (July 7, 2014; Chris Daley) cited a Grand Jury report that indicated the following:

> …several county departments and individuals failed to protect the public from threats to the environment and to the health of local residents. The report cites the departments of Transportation and Community Development as well as the District Attorney's Office at best for inattention and perhaps ineptitude or bowing to political pressure regarding the lack of enforcement of several county ordinances, particularly the "Grading, Erosion and Sediment Control Ordinance."

This is an obvious matter of concern; if ordinances are developed but not enforced, what assurance is there that mitigation measures developed to protect wildlife and wildlife habitat under this dEIR (or in the 2004 General Plan) will be enforced?

Please provide in an appendix to the final EIR:

- **The EDC department responsible for overseeing and enforcing the mitigations proposed in this dEIR.**
- **Describe the staffing levels and funding of departments responsible for mitigation oversight, and include an estimate of whether it is likely they can handle their respective workload(s).**
- **Describe whether EDC staff will be responsible for overseeing and reviewing projects post-implementation to make certain they are in compliance with ordinances (including mitigation measures), or if subsequent compliance "monitoring" will be reliant upon complaints from the public (residents).**
- **Describe who will handle public "complaints" regarding mitigation violations, and to what degree EDC staff is obligated to respond to complaints from the public.**

(9) This dEIR is difficult to review.

The dEIR is disorganized and difficult to review. It is full of confusing statements, any understanding of which is undermined by the imprecise use of language, the inclusion of undefined terms, and—in too many cases—contradictory statements. It also "asks" the reviewer to take leaps of faith, to rely on claims made in the dEIR; it does not provide information upon which to reasonably evaluate project impacts and impact mitigations.

For instance, meaningful review is complicated by the fact that the reviewer must make an attempt to estimate project impacts to biological resources when "the experts" make no attempt to do so, stating that *"[t]here is no specific development project being proposed at this time, and the number, size, and habitat value of sites to which the proposed amendments might be applied cannot be known because this will depend upon the future proposals of individual land owners"* and ***"****No specific level of future development was forecast during this analysis because there is no reasonable way to know how many of the uses allowable under the project may be approved in the future, and the locations of such uses cannot be known at this time*."(pages 3.4-29 & 30; 3.4-25)

To exacerbate difficulty of review, these nebulous accounts of development potential are often accompanied by statements of "significant and unavoidable" impacts. **Without concrete information on the magnitude of development, and the viability of mitigation programs, this "conclusion" is unsubstantiated.**

The reviewer is put in a similar situation (required to perform an evaluation in the absence of supporting information) when attempting to estimate the value of mitigations. In this instance, the reviewer is asked to put full faith in the efficacy of not yet developed mitigation programs. **What remains is not an impact analysis at all; it is a series of development proposals whose magnitude cannot be estimated, coupled with "mitigation measures" that—while presented as viable measures—have for the most part not been developed (and may never be developed).**

CEQA intends EIR documents to be easily understood by the public; that is what is prescribed. This document does not accomplish that goal.

251007

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comments on the Legislative Draft Land Development Code

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 8:16 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **Cedric Twight** <CTwight@spi-ind.com>
Date: Mon, Jul 21, 2014 at 5:41 PM
Subject: Comments on the Legislative Draft Land Development Code
To: Shawna Purvines <shawna.purvines@edcgov.us>

Shawna,

Throughout the Legislative Draft Land Development Code, Timber "Preserve" should be changed to Timber "Production.

The highlight below from Part B of the Legislative Draft Land Development Code conflicts with the proposed Zone Ordinance that excludes Public Utilities facilities from TPZ. Has the County reached out to the Utilities that operate in El Dorado regarding the new limitation on Public Utility Facilities? How many Public Utility facilities exist currently? Is there any expectation from the Utilities for a need to build a Public Utilities facility?

Page 695 of 941

Sec. 130.14.070. Public utility distribution, transmission lines and/or facilities.

Public utility distribution, transmission lines and/or facilities, both overhead and underground shall be allowed in all except AA zone districts; provided that the routes and site locations of the proposed transmission lines and/or facilities shall be submitted to the Planning

Commission or the Zoning Administrator for site plan review or special use permit during the preliminary planning stages and prior to the adoption of the routes and site location or acquisition of right-of-way therefor.

A. Public utility distribution, transmission lines, and/or facilities shall for the purposes of this section, mean:

1. Public utility towers and/or structures supporting power lines of 50,000 volts potential and over;

2. Trunk telephone lines, supporting structures and saucers;

3. Sewer and water lines 12 inches or more inside diameter;

4. Natural gas pipe six inches or more inside diameter;

5. Sewer and water lift stations, telephone equipment buildings, and natural gas storage and distribution facilities;

B. Public utility distribution, transmission lines and/or facilities as described in Subsection A of this section are permitted by right without Planning Commission or Zoning Administrator review when said facilities do not exceed 15 feet more than the height limitation of the zone district and setbacks of the zone district, and do not create potential safety and health hazards to adjacent property owners, present or future.

1. Notwithstanding, in all cases where construction is proposed in an AA zone district, site plan review and approval is required.

C. Site plan review required.

1. All cases where the public utility distribution transmission lines and/or facilities exceed height limitations of the zone district as set forth in Subsection B of this section and less than 150 feet in height or do not comply with setback requirements,

LEGISLATIVE DRAFT

shall be subject to site plan approval before the Planning Commission or Zoning Administrator.

2. Notice of the site plan review hearing shall be provided to all property owners within 500 feet of the proposed location. Said notice shall be provided ten days prior to the scheduled hearing.

D. Special use permit required.

1. All cases where the construction of the public utility distribution transmission lines and/or facilities creates, as determined by the Planning Commission or Zoning Administrator, potential safety or health hazard to adjacent property owners, present or future, shall require a special use permit;

2. All cases where the construction of the public utility distribution, supporting structures and/or facilities exceed 150 feet in height shall require a special use permit;

3. The foregoing shall apply within the limitations of State and Federal law preemption.

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Shawna L. Purvines
Principal Planner

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251008

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 8:14 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **Kim Hatch** <khatch1900@yahoo.com>
Date: Mon, Jul 21, 2014 at 8:19 PM
Subject: DEIR
To: "shawna.purvines@edcgov.us" <shawna.purvines@edcgov.us>

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,
Kimberly Hatch
Shingle Springs, CA

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251009

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on Draft EIR for TGPA-ZOU

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 8:17 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **Jill Larner** <jalarner@comcast.net>
Date: Mon, Jul 21, 2014 at 8:50 PM
Subject: Comment on Draft EIR for TGPA-ZOU
To: shawna.purvines@edcgov.us
Cc: bosone@edcgov.us, bostwo@edcgov.us, bosthree@edcgov.us, bosfour@edcgov.us, bosfive@edcgov.us, edc.cob@edcgov.us

Please find the attached file containing comments on the Draft EIR for the TGPA-ZOU.

Thank you,

Greg & Jill Larner

4590 Fawn Street

Shingle Springs

jalarner@comcast.net

--

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TGPA-ZOU DEIR Comments 7.21.14.pdf
16K

July 21, 2014

El Dorado County Community Development Agency, Long Range Planning
Attn: Shawna Purvines

Re: Comment on Targeted General Plan Amendment and Zoning Ordinance Update Draft EIR

Dear Ms. Purvines,

We are writing to provide comment on the Targeted General Plan Amendment and Zoning Ordinance Update (TGPA-ZOU), specifically in regards to how it will impact property located adjacent to our neighborhood. Parcel APN 319-260-01 is a 62 acre parcel located at the northwest corner of Mother Lode and Greenstone Road. This parcel is currently zoned RE-5, but is proposed to be rezoned to Research and Development (R&D).

The 62 Acre Parcel borders our neighborhood, known as Deer Hills, located just west of Greenstone and north of Motherlode Drive (Fawn, Doe and Buck Streets). Deer Hills is zoned Medium Density Residential (MDR) with 45 three acre parcels and a beautiful seven acre private lake.

In response to the Draft Environmental Impact Report, we oppose the rezoning of the 62 Acre Parcel to R & D because it would allow potential land uses that are a huge leap from the zoning of Deer Hills. Also, there are too many allowable uses under the R&D zoning that could have significant negative impacts that have not been fully analyzed in the TGPA-ZOU process for their impact on Deer Hills

If the 62 Acre Parcel adjacent to Deer Hills is rezoned to R&D, many, if not most, of the allowed uses could have significant undesirable consequences for our rural neighborhood. The DEIR does not provide any detailed analysis on the impacts of the following allowed uses on Deer Hills (these are just a few examples):

1. Wholesale Storage and Distribution (R&D Allowed Use). Potential impacts include Noise from delivery trucks at all hours, Light pollution from security systems, Transportation and Traffic from increased traffic at an already dangerous intersection, Aesthetics without clear design guidelines*, Air Quality from increased truck traffic, and Land Use incompatibility and lack of buffers.
2. Light Manufacturing (R&D Allowed Use): Potential impacts include Noise from delivery trucks, Light pollution from security systems, Transportation and Traffic from increased traffic at an already dangerous intersection, Aesthetics without clear design guidelines*, Air Quality from emissions, Odor, Water Contamination into our small lake, and Land Use incompatibility and lack of buffers.
3. Restaurant (R&D Allowed Use): Potential impacts include Noise from delivery trucks at all hours, Light pollution from security systems, Transportation and Traffic from increased traffic at an already dangerous intersection, Aesthetics without clear design guidelines*, Air Quality from the smells that are associated with a restaurant and its waste, and Land Use incompatibility and lack of buffers.
4. Outdoor Sports and Recreation facility (R&D Allowed Use): Potential impacts include Noise from delivery trucks and high occupancy uses, Transportation and Traffic from increased traffic at an already dangerous intersection, Aesthetics without clear design

guidelines, Light Pollution from possible night time activities, and Land Use incompatibility and lack of buffers.

5. Airports, Airstrips and Heliports (R&D allowed use with CUP): Potential impacts include Noise from aircraft, Light pollution from security systems, Transportation and Traffic from increased traffic at an already dangerous intersection, Aesthetics without clear design guidelines, and Land Use incompatibility and lack of buffers.
6. Hazardous Materials Handling Facility (R&D allowed use with CUP): Potential impacts include Noise from delivery trucks, Transportation and Traffic from increased traffic at an already dangerous intersection, Aesthetics without clear design guidelines*, Air Quality from emissions, Odor, Water Contamination into our small lake, and Land Use incompatibility and lack of buffers.

We do not believe that the impacts have been fully analyzed for this particular parcel rezone and that the proposed zoning is incompatible with the adjacent MDR zoning. For these reasons, we oppose the rezoning of the 62 Acre Parcel (APN 319-260-01) to R&D in this ZOU. We suggest the County consider a General Plan Amendment to change the Land Use Designation of the 62 Acre Parcel to RE-5, or other Residential Use which is a *gradual land use change from MDR*.

Sincerely,

Greg and Jill Larner
Deer Hills Homeowners

4590 Fawn Street
Shingle Springs, CA 95682
jalarner@comcast.net

*Design Guidelines adopted by the County are outdated (adopted in 1981) and cannot be relied upon to provide adequate protection between R&D and Residential Zones.

Cc: Board of Supervisors

251010

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TCGA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 8:18 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: <dvinones@aol.com>
Date: Mon, Jul 21, 2014 at 10:43 PM
Subject: Fwd: Comment on TCGA-ZOU DEIR
To: shawna.purvines@edcgov.us

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report on the county's Targeted General Plan Amendments and Zoning Ordinance Update be CLEAR and CONCISE! Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act law so that I can make informed decisions about its impact to my quality of life. Reading through the 25 page proposed TGPA left me with many questions and concerns!

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how this will effect my family and me directly and indirectly by this proposed Targeted General Plan Amendments and Zoning Ordinance Update

Thank you,

Karen Warner
Shingle Springs

--

Shawna L. Purvines
Principal Planner

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251010

251011

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 8:18 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

---------- Forwarded message ----------
From: Ellen Katz <ek4575@att.net>
Date: Tue, Jul 22, 2014 at 6:51 AM
Subject: Comment on TGPA-ZOU DEIR
To: shawna.purvines@edcgov.us, Ron Mikulaco <bosone@edcgov.us>, Ray Nutting <bostwo@edcgov.us>, Brian Veerkamp <bosthree@edcgov.us>, Ron Briggs <bosfour@edcgov.us>, Norma Santiago <bosfive@edcgov.us>, edc.cob@edcgov.us

Dear Ms. Purvines and El Dorado County Supervisors,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I join my name to hundreds of others by requesting that you ensure that the Final EIR will have **clear and concise data and analysis** so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,

Ellen Katz
4575 Hillwood Drive
Shingle Springs, CA 95682

--

Shawna L. Purvines
Principal Planner

County of El Dorado
Community Development Agency

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251012

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 8:21 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **Ellen Obradovic** <ellenobradovic@gmail.com>
Date: Tue, Jul 22, 2014 at 8:11 AM
Subject: Comment on TGPA-ZOU DEIR
To: shawna.purvines@edcgov.us, bosone@edcgov.us, bostwo@edcgov.us, bosthree@edcgov.us, bosfour@edcgov.us, bosfive@edcgov.us, edc.cob@edcgov.us

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,
Ellen Obradovic

2636 Gold Trail
Placerville, CA 95667

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251013

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Feedback regarding DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 8:21 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

---------- Forwarded message ----------
From: **Julie Mack** <juliemack@yahoo.com>
Date: Tue, Jul 22, 2014 at 8:10 AM
Subject: Feedback regarding DEIR
To: "To:" <shawna.purvines@edcgov.us>, "bosone@edcgov.us" <bosone@edcgov.us>, "bostwo@edcgov.us" <bostwo@edcgov.us>, "bosthree@edcgov.us" <bosthree@edcgov.us>, "bosfour@edcgov.us" <bosfour@edcgov.us>, "bosfive@edcgov.us" <bosfive@edcgov.us>, "edc.cob@edcgov.us" <edc.cob@edcgov.us>

Dear Ms. Pervines and all EDC Board of Supervisors,

As a resident of Shingle Springs, El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the County's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Yet it is not.

Indeed, a DEIR, as required by the California Environmental Quality Act (CEQA), should be specific and detailed so that I can make informed decisions about its impact to my quality of life here in EDC.

It is unrealistic for County supervisors to expect that this huge, 1,212-page, vaguely-written document could help me (and my neighbors) understand the impacts of the proposed TGPA-ZOU.

As it stands now - the Draft EIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

So, I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Regards,

Julie Mack

"The smallest act of kindness is worth more than the grandest intention." - Oscar Wilde

251013

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Shawna L. Purvines
Principal Planner

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TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 8:20 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **Dave at Skyline Silversmiths** <daveh@skylinevaquero.com>
Date: Tue, Jul 22, 2014 at 8:00 AM
Subject: Comment on TGPA-ZOU DEIR
To: shawna.purvines@edcgov.us, bosone@edcgov.us, bostwo@edcgov.us, bosthree@edcgov.us, bosfour@edcgov.us, bosfive@edcgov.us, edc.cob@edcgov.us

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,

Dave Hammond
3888 Many Oaks Lane
Shingle Springs, CA 95682

WWW.SKYLINEVAQUERO.COM
Dave Hammond

916 801 9465

251014

--

Shawna L. Purvines
Principal Planner

County of El Dorado
Community Development Agency
Long Range Planning
2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362/Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

251015

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 8:19 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **cmcrmc1 .** <cmcrmc@gmail.com>
Date: Tue, Jul 22, 2014 at 7:09 AM
Subject: Comment on TGPA-ZOU DEIR
To: shawna.purvines@edcgov.us, bostwo@edcgov.us, bosthree@edcgov.us, The BOSFOUR <bosfour@edcgov.us>, bosfive@edcgov.us, edc.cob@edcgov.us

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU. This report must be very clear in understanding how this report affects the land I own in the country!!!

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU. As a land owner you must make sure this report does not effect my existing house and land!!

Thank you,
Richard and Connie Cashdollar
5314 Old French Town Road
Shingle Springs, Calif
95682

--

Shawna L. Purvines
Principal Planner

County of El Dorado
Community Development Agency

251015

Long Range Planning
2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362/Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

261017

COMMENT LETTER FOR PROPOSED REZONING OF EID BASS LAKE APN 115-400-12

Bald Eagle, December 2012
2180 Summer Drive
Basil Court and Summer Drive – WoodRidge
El Dorado Hills, CA

July 21, 2014

El Dorado County Development Agency
Long Range Planning
2850 Fairlane Drive, Bldg. C
Placerville, CA 95667

Attn: Shawna Purvines, Senior Planner

RE: LUPPU Proposed Rezoning of APN 115-400-12, 3240 Bass Lake Road
From RF – Adopted Plan to RFH – High Use Recreation
El Dorado Irrigation District (EID) property containing Bass Lake

EID owned APN 115-400-12 is proposed to be rezoned under the El Dorado County Land Use Policy Programmatic Update (LUPPU – now LRP) from its current status as Recreational Facilities (RF) – Recreation with a land use of Adopted Plan (AP) to Recreational Facilities high - intensity (RFH) – Recreation, High Usage zoning which would allow the property to be used for recreational activities with high concentrations of people, such as sports fields, sports complexes, recreational parks and amusement parks. See attached map. **(Attachment 1)**

We believe this proposed zoning change would be in direct contravention to the El Dorado Hills Specific Plan (EDHSP), which specifically designates the EID Bass Lake parcel as permanently dedicated to open space and low impact recreation. Additionally, this property is in a Rural Region where Recreational Facilities low-intensity (RFL) zoning would be allowed but not RFH according to the El Dorado County TGPA/ZOU Draft EIR Project Description.

According to Chapter 17.25 – Special Purpose Zones 17.25.010, C 1. "Recreational Facilities, Low-Intensity (RFL) is applied to regulate and promote dispersed recreational and tourist accommodating uses and activities primarily in Rural Regions or Rural Centers of the County where such uses are compatible with adjacent or nearby rural residential, agricultural or resource development. Uses include but are not limited to camping, picnicking, equestrian staging and river put-in take-out."

Designated Village "R" in the EDHSP the lake and surrounding 157 acres of the EID Bass Lake reservoir and water treatment facility were once used as a low impact recreation area for fishing and boating while under private ownership. At one time called the American Reservoir, the lake has been in use since the 1850's. EID has owned this property since 1969 and it is no longer available for public use.

The US Fish and Wildlife Service National Wetlands Inventory considers this area as wetlands with historic wetlands on the site. It is also part of the Carson Creek watershed with the north

branch of Carson Creek draining the lake. The area supports a wide variety of wildlife including but not limited to Bald Eagles who have inhabited the site for well over 40 years and American White Pelicans who visit all year round.

Following are the reasons we believe it would be a mistake to rezone this valuable environmental and historical resource which should be preserved for future generations and will one day be the only open space between Cameron Park and El Dorado Hills.

1. El Dorado Hills Specific Plan and Environmental Impact Report

   A. *"Should conflicts arise between the provisions of the planned development overlay zone standards and those standards and policies of the Specific Plan, the latter shall prevail. All subsequent subdivision and development, all public works projects, and all zoning regulations must be consistent with the Specific Plan."*
   EDHSP December 23, 1987 Section 1. Introduction 1.1.1 Implementation of Policies
   (Attachment 2)

   California Government Code section 65455 states that, "No public works project may be approved, no tentative map or parcel map for which a tentative map was not required may be approved, and ***no zoning ordinance may be adopted or amended within an area covered by a specific plan unless it is consistent with the adopted specific plan.***"

   B. *"Village "R" constitutes 157 acres of El Dorado Irrigations District's (EID) Bass Lake water reservoir and water treatment facility. Once used as a recreation area, the lake and surroundings properties are no longer available for public use".*

   "In spite of its restricted access, Bass Lake does offer a visual water amenity to the North Uplands Golf Course Neighborhood and to travelers using Bass Lake Road. The lake and surrounding properties also constitute an additional area of permanent open space which, if feasible, should be returned to public recreational use in the future. No development is proposed for Village "R"."
   EDHSP Draft EIR Area Place Designations Map Figure 4-1 refers to Village "R" as open space conservation.
   EDHSP Draft EIR October 1987 - Area Plan Designations Map Figure 4-1
   EDHSP Residential Land Use Element, Section 2, Village R, page 35
   EDHSP Draft EIR, October 1987-Open Space Map Figure 2.10/Proposed Zoning Map 1a Figure 4-3
   (Attachments 3-6)

   C. *"Natural Open space, as designated in the Specific Plan, will be preserved in perpetuity in an essentially unaltered condition. No development will occur within these areas except for maintenance, fire protection, trails and permitted uses. Use*

will be restricted to such activities as jogging, hiking, and horseback riding, where the impact will be minimal."
EDHSP Design Guidelines, Appendix B, Section 5.0 Open Space, Parks and Recreation, Trails and Paths, 5.2, Natural Open Space, page B-12 **(Attachment 7)**

D. *"The north branch of Carson Creek that drains Bass Lake has considerably less riparian dependent vegetation that the main branch."*
EDHSP Draft EIR, October 1987/Chapter 12, Vegetation, Wildlife and Aquatic Resources, page 12-8 **(Attachment 8)**

E. *"Village "J" is bounded on the northeast by the exterior of the Specific Plan area and on the south by Country Club Drive. It includes the Bass Lake Road and the Bass Lake water reservoir which is designated as open space."*
EDHSP, Section 2. Residential Land Use Element, page 33 **(Attachment 9)**

F. *"Bass Lake – (approximately 154 acres) A large year round lake at the east edge of the Plan Area has special value as wildlife habitat."*
EDHSP Draft EIR, October 1987, page 12-11/Chapter 12, Vegetation, Wildlife and Aquatic **(Attachment 10)**

2. 2004 General Plan Conservation and Open Space Element

A. *Preservation of Open Space*
"Goal 7.6 Open Space Conservation
Conserve open space land for the continuation of the County's rural character, commercial agriculture, forestry and other productive uses, the enjoyment of scenic beauty and recreation, the protection of natural resources, for protection from natural hazards, and for wildlife habitat."

a. *Policy 7.6.1*
"Conserving natural resource areas required for the conservation of plant and animal life including habitat for fish and wildlife species; areas required for ecologic and other scientific study purposes; rivers, streams, banks of rivers and streams and watershed lands;"
El Dorado County General Plan – Conservation and Open Space Element July 2004 Page 157 **(Attachment 11)**

3. General Plan Plan Use Designation and Zone Consistency/Draft TGPA/ZOU EIR

A. *El Dorado County Impact Analysis Biological Resources El Dorado County TGPA/ZOU Draft Program EIRSCH# 20120520743.4-24March 2014ICF 00103.12*
λ Section 17.25.010 and 17.25.020
"Recreational Facilities, Low-intensity [RFL] and Recreational Facilities, High-intensity [RFH]) RFL zoning would be allowable in Rural Regions and Rural

Centers; RFH zoning would be "primarily located in Community Regions and Rural Centers.""

B. *"Table 2.2 El Dorado County Project Description Draft EIR attached shows RFH in OS Open Space only when located within a Community Region and the Bass Lake parcel is outside the Community Region."*
See attached map and table. **(Attachment 12)**

4. Environmental Background

A. *The EID Bass Lake property is listed in the US Fish and Wildlife Service National Wetlands Inventory. There are two historic wetlands on the East side of the lake. This area is deemed to be Waters of the United States.*
See attached map and the decoding documentation for the map.
(Attachment 13)

B. *In a letter dated, June 12, 2003 from Larry L. Eng, PHD, Deputy Regional Manager, the Department of Fish and Game, to Mr. Gary Hyden, EDC Park Department, regarding the May 16, 2003 Notice of Preparation of an EIR for the proposed 41 acre Bass Lake Regional Park property which is adjacent to the EID Bass Lake property, the following comments were made.*

a. *"Bass Lake and the surrounding shoreline, including lands within the proposed park site, are valuable habitat areas for resident and migratory bird. At least one bald eagle (haliaeetus leucocephalus) has been a frequently observed winter visitor there in recent years, and has often been observed along the shoreline near or inside of the boundaries of the proposed park. Also, Bass Lake is a valuable feeding and resting area for wintering waterfowl, including ring-necked ducks, etc."*

b. *"Development of ball fields, a golf course, nature interpretation facilities, a community center, pathways, and other facilities, as well as the human use, can be expected to greatly reduce resident and migratory bird use of the area.*

c. *Besides the direct permanent removal of habitat from project construction, many of the bird species are very sensitive to human disturbances which can be expected from operation of the park. For example, the development and use of a perimeter trail has the potential to significantly affect foraging areas for birds, such as the bald eagle, great egret, and many species of water fowl."*
(Attachment 14) Complete Letter attached.

C. *Bass Lake Road Realignment Draft EIR, 1992, Appendix B, NOP Comments (now called Silver Springs Parkway) has two comment letters regarding the Bald Eagles at Bass Lake.*

a. *From D. Bruce Swinehart, Jr., Biology Professor, American River College to Kris Payne, EDC DOT, stating "I have been aware of the wintering eagles at Bass Lake for the last forty years." "I take my ornithology field classes to Bass Lake at least twice a year to see the eagles, waterfowl and other birds." "I hope your county will realize the tremendous resource a place like Bass Lake is."*
(Attachment 15) Letter dated 12/27/1991.

b. *From Roger E. Johnson, resident of the area to Kris Payne, EDC DOT, stating "My family and I have enjoyed watching the bald eagles at Bass Lake for the past four winters since moving to Rescue."*
(Attachment 16) Letter dated December 30, 1991

D. *SMUD stated the California Natural Diversity Data Base reported eagles have wintered at Bass Lake for over forty years in 2002-2003. Residential development was identified as a major concern to wintering Eagles at Bass Lake.*

E. *The Aububon Society states during their December 2012 bird count finding waterfowl species including Mallard, American Widgeon, Ring Necked Duck, Bufflehead, Canada Goose, and Greater Whitefronted Goose. Other species seen were Turkey Vultures, Wild Turkey, Great Blue Heron, Great Egret, Double-crested Cormorant, Killdeer, and Lark Sparrow. They also reported eagles at Bass Lake in their December 2011 bird count.*

F. *Over the years, the residents of the Bass Lake Area have seen Bald Eagles, Ospreys and several different kinds of hawks as well as American White Pelicans who have been arriving for at least ten years. American White Pelicans are experiencing a declining habitat and are protected by the Migratory Bird Treaty Act of 1918. It has the California Department of Fish and Game protective status and the California Species of Special Concern (CSC).*
(Attachment 17) Picture attached.

A pair of swans remained at Bass Lake over the Summer of 2013 and returned in the Fall. Recently a Golden Eagle was spotted around the EID Bass Lake property sitting on a pole and a Bald Eagle was seen by a nearby Serrano resident. A photo of a Bald Eagle was taken by Joe D'Amico at 2180 Summer Drive (WoodRidge) near the intersection of Basil Court and Summer Drive, December 2012 . The bird had been recently eating a fish in the tree.
(Attachment 18) A copy of this photo is attached and a document Environmental Impacts, Eagles/Pelicans at EID Bass Lake, Bass Lake Wetlands and Historic Wetlands

G. *This is a valuable historical site having served the residents of the Bass Lake area with water and the town of Clarksville when it was the Bass Lake predecessor*

American Reservoir as early as the 1850's. The attached map is a General Land Office Plat of the Township.
(Attachment 19) Historic Map Attached

In conclusion, we understand from an email from Shawna Purvines (email of September 24, 2013 to Ellen Van Dyke attached), the EDC Long Range Planning staff felt this property should be rezoned because when the EDC Parks and Trails Master Plan was approved it included a previous master plan for the proposed Bass Lake Regional Park (BLRP) including the EID property APN 115-400-12. The proposed BLRP, APN 115-400-02 has a proposed LUPPU zoning of RE-5 and was identified to potentially include intensive uses and amenities such as a community center, ball fields, etc. It is also in a Rural Region and parts of it adjoin Green Springs Ranch. **(Attachment 20 with map of park)**

An Environmental Impact Report was never completed for the proposed BLRP property and previously quoted information in this letter from the Department of Fish and Game to EDC is listed under Number 4, Environmental Background, B, and states there would have been potentially significant environmental impacts if the project had moved forward as proposed.

Additionally, the 2012 EDC Parks and Trails Master Plan states the proposed BLRP plans need "to be revisited taking into consideration new residential developments, local parks and road projects in the area." "More passive uses such as trails and nature may have greater value as the El Dorado Hills and Cameron Park communities are becoming more densely developed." "These types of uses would also have fewer environmental impacts and cost less to develop and maintain." (RP4) **(Attachment 21)**

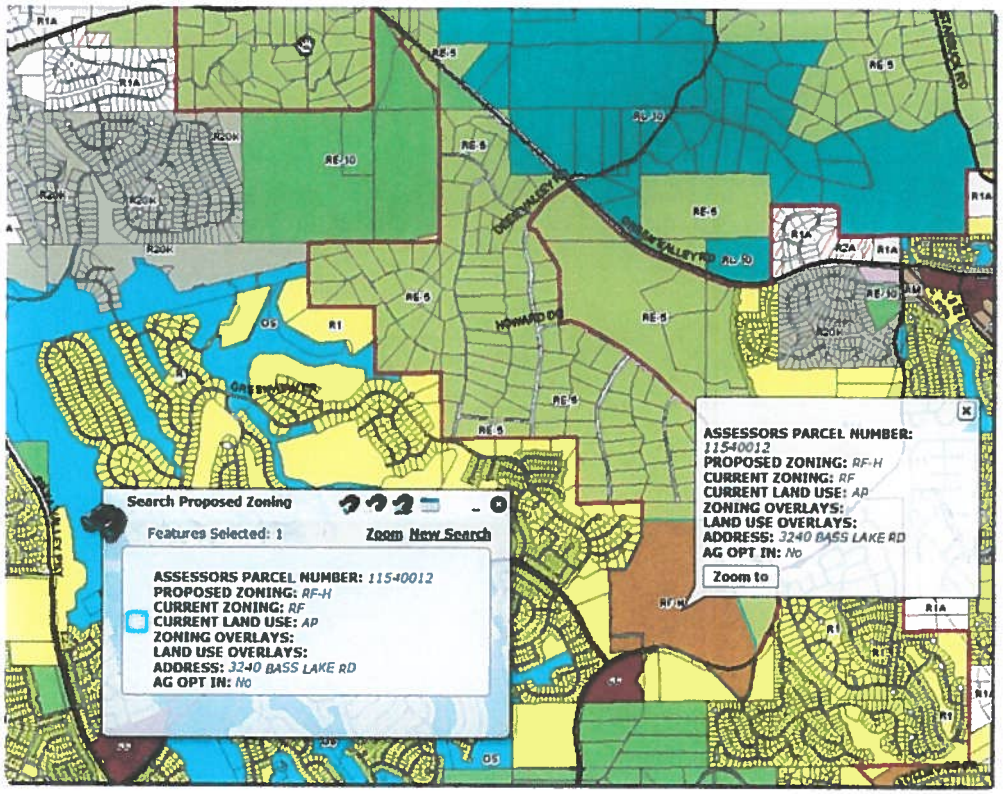
Page 57 of the EDC Parks Master Plan states "The master plan will need to be revisited before improvements for this site are implemented to reflect changes in community needs and recreation trends."

Bass Lake and the surrounding wetlands are much enjoyed by the residents of our area and it is a visual water amenity for us which supports a varied wildlife community as well. The EID Bass Lake property is a significant environmental and historical asset for the Bass Lake and El Dorado Hills area and should be protected with a parcel zoning of Recreational Facilities –Low Intensity (RFL) and an open space (conservation) land usage as shown in the EDHSP. I believe the facts stated in this letter support this conclusion.

Sincerely,

Kathleen M. Prevost
1080 Jasmine Circle
El Dorado Hills, CA 95762
530 672-6836

ATTACHMENT 1



BASS LAKE EID
PROPERTY
PROPOSED HLPPU REZONING

7/19/2014 5:50 PM

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SECTION 1. INTRODUCTION

1.1 Purpose and Content of the Specific Plan

The purpose of the El Dorado Hills Specific Plan is to provide for the orderly and systematic development of the Plan Area in a manner consistent with the policies of El Dorado County and with the characteristics of the land. This purpose will be achieved by establishing a master plan for the development of approximately 4,000 acres of property that will contain an orderly, comprehensive program of development controls and implementation measures.

1.1.1 Implementation of Policies

The El Dorado Hills Specific Plan is designed to be consistent with, and represent a refinement and expansion of, the broader policies set forth in the El Dorado County Long Range Plan and the El Dorado Hills/Salmon Falls Area Plan. It provides a transition between those policies and the implementation regulations contained in both the zoning and subdivision ordinances. The plan's policies and standards will be implemented through land use entitlements granted subsequent to adoption of the Specific Plan, including zoning consistent with the Specific Plan. In addition, the use of the County's planned development overlay zoning designation will further ensure that development within the Specific Plan area occurs pursuant to the policies and standards of the Specific Plan. Should conflicts arise between the provisions of the planned development overlay zone standards and those standards and policies of the Specific Plan, the latter shall prevail. Similarly, the standards and policies of the planned development district shall prevail over conflicting provisions which may be applicable in the underlying zoning district. All subsequent subdivision and development, all public works projects, and all zoning regulations must be consistent with the Specific Plan.

1.1.2 Control of the Quality of Future Development

Goals and policies are established within the text of this Specific Plan in order to guide future development. In addition, Design Guidelines and conceptual Master Covenants, Conditions, and Restrictions (CC&Rs) will serve to provide more definitive controls for development. The Design Guidelines are included in the Specific Plan as Appendix B.

A Development Agreement will ensure compliance with the Design Guidelines, Master CC&Rs, Specific Plan, and applicable County ordinances and regulations.

1.1.3 Implementation Measures

The Specific Plan sets forth implementation measures to ensure the ultimate fulfillment of the plan concepts. These measures include:

- Goals and Policies
- Master Covenants, Conditions, and Restrictions
- Design Guidelines
- Funding Mechanisms to Provide for Specific Public Improvements
- Development Agreements

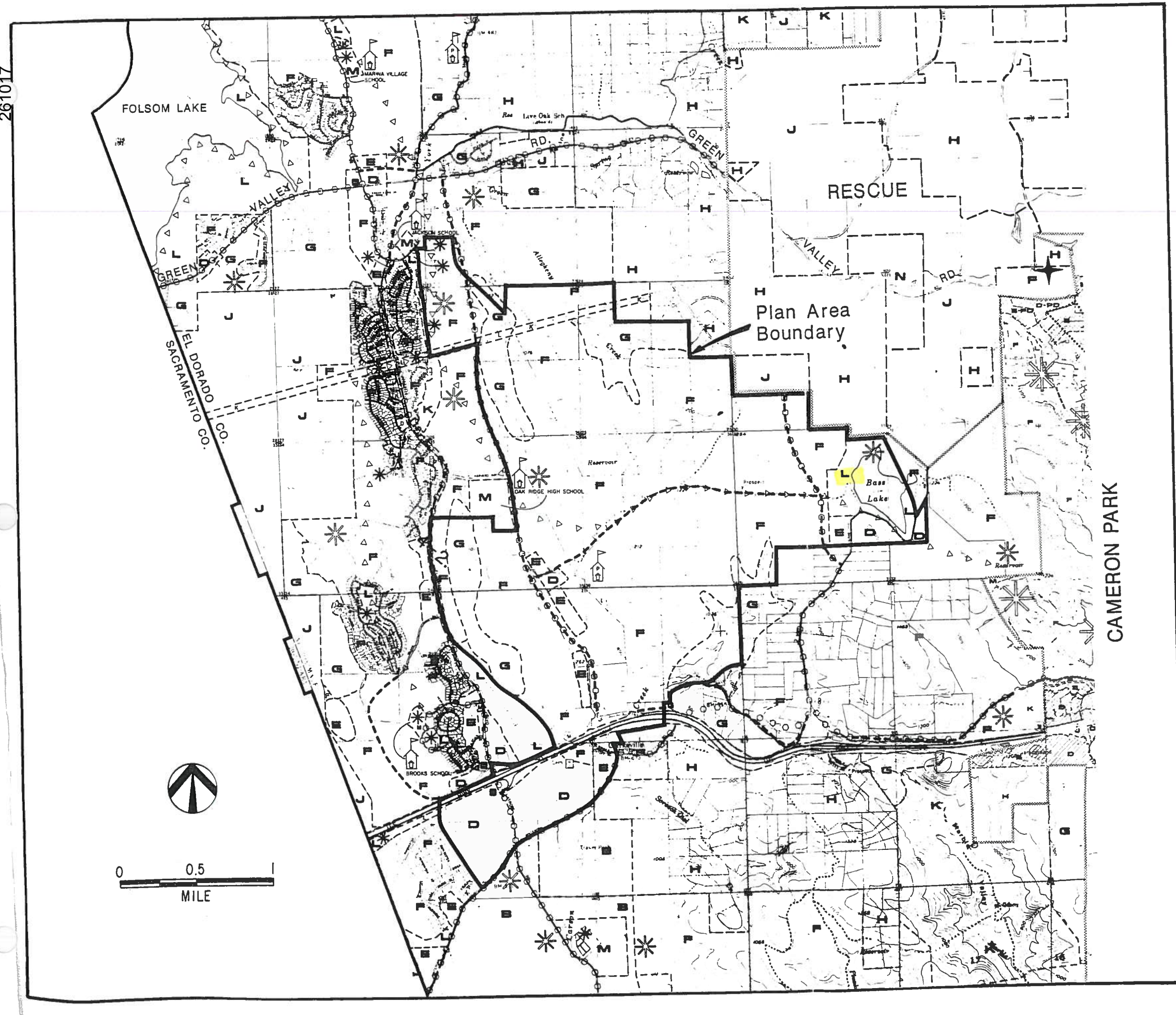
Each of these measures is applied individually or in concert with other measures to implement the intent of the Specific Plan. The application of these measures is described in Section 9, "Implementation."

ATTACHMENT 3

EDHSP ~~DECEMBER~~ OCTOBER 1987
EIR

261017

FIGURE 4-1.
AREA PLAN DESIGNATIONS



El Dorado Hills/Salmon Falls Area Plan

- B Industrial
- D Commercial
- E Multi-Family Residential
  12 du maximum per acre
  20 du maximum per acre with PD
- F High Density Residential 5 du maximum per acre
- G Medium Density Residential 1 du/1.0-4.9 acres
- H Low Density Residential 1 du/5.0-9.9 acres
- J Rural Residential Agriculture 1 du/10-160 acres
- K Open Space/Conservation
- L Parks/Recreation
- M Public Facility

Rescue Area Plan

- B Industrial
- C Commercial
- M Public Facilities
- L Parks
- F High Density Residential 4 du per acre
- G Residential 2 ac. minimum parcel
- H Residential Agriculture 5 ac. minimum parcel
- J Residential Agriculture 10 ac. minimum parcel
- N Exclusive Agriculture
- ✦ Proposed school sites as shown on the 1969 General Plan

Cameron Park Area Plan

- B Industrial
- D Commercial
- E Multi-Family Residential 3.1-20 du/ac.
- F Single Family Residential
  High Density 1.1-3 du/ac.
  F-PD* 4.2 du/ac.
- G Single Family Residential
  Medium Density 1 du/1.0-4.9 acres
- H Single Family Residential
  Low Density 1 du/5.0-9.9 acres
- J Rural Residential Agricultural
  1 du/10-60 acres
- K Public Facility
- L Open Space/Conservation
- M Parks/Recreation
- ▨ Design Control
- PD Requires Planned Unit Development

- FUTURE ROAD EXTENSIONS
- RECREATION & BICYCLE ROUTES
- HIKING & EQUESTRIAN ROUTES
- EXISTING SCHOOLS
- PROPOSED SCHOOL SITES
- EXISTING PARKS
- PROPOSED PARK SITES
- PARK & RIDE

ATTACHMENT 4

EDHSP SECTION 2
RESIDENTIAL LAND USES
DECEMBER 23, 1987

261017

VILLAGE "M"

Village "M" constitutes a variation from the mix of housing types found elsewhere in the Specific Plan. This is due to the sensitive character of the village in terms of dense tree cover, wildlife habitat, and rolling-to-steep topography. As a result, this village is reserved for the largest lots within the Specific Plan area, Ranch Estates (RE) of 4-7 acres in size. These rural lots also act as a buffer between the edge of the Plan Area and the large rural lots to the north and the agricultural preserve to the east. The rural character of Village "M" will be maintained by the use of a standard rural road system of aggregate or chip seal surface. Water and sewer lines will be located within the public right-of-way. Road connections to the north are not expected to permit incompatible traffic volumes that would impact the rural setting and natural amenities of the village. Village "M," although large in acreage, is appropriate for approximately 37 dwelling units.

VILLAGE "R"

Village "R" constitutes 157 acres of the El Dorado Irrigation District's (EID) Bass Lake water reservoir and water treatment facility. Once used as a recreation area, the lake and surrounding properties are no longer available for public use. The lake is now a potable water storage area for use by EID as a source of gravity-fed domestic water for the El Dorado Hills area. A treatment plant and caretaker's residence are also situated in Village "R."

In spite of its restricted access, Bass Lake does offer a visual water amenity to the North Uplands Golf Course Neighborhood and to travelers using Bass Lake Road. The lake and surrounding properties also constitute an additional area of permanent open space which, if feasible, should be returned to public recreational use in the future. No development is proposed for Village "R."

2.5.2 Development Neighborhood #2

The South Uplands Golf Course Neighborhood constitutes an area lying between the North Uplands Golf Course Neighborhood and Highway 50 in the southeastern portion of the Specific Plan area. It is a large area of gentle slopes and less tree cover than exists in the North Uplands Golf Course Neighborhood. This setting leaves less area for preservation as natural open space. However, additional water amenities are provided to increase the riparian habitat and the visual character of this neighborhood. Envisioned as a second golf course community, this neighborhood would also permit construction of an 18-hole golf course through the valleys and drainage course. Overall densities in this neighborhood are slightly higher due to the difference in topography and the need to maximize effective open space.

In addition to the golf course, a country club and related facilities also may be provided south of Country Club Drive, although its location will depend on the final design and plans for golf course development. The South Uplands Golf Course Neighborhood contains four separate villages oriented to the golf course and natural open space areas. Consistent with the Specific Plan, certain housing types are also allocated in this neighborhood based on natural land constraints and proximity to existing or planned amenities.

The villages within the South Uplands Golf Course Neighborhood include the following:

VILLAGE "C"

Village "C" is defined by the contiguous natural open space areas to the west and south and the proposed golf course to the east. This village also lies along a north-south ridgeline of gentle to moderate slopes that contain very few trees but excellent views of the Sacramento Valley. View Lots (VL) are designated along the west side of the ridge, with larger Estate Homes (EH) anticipated in the interior of the village and on the east ridgeside. Fairway Estates (FE) are suitable uses fronting the golf course at the east side of the village. An area of Ranch Estate

261017

ATTACHMENT 5

EDHSP OCTOBER 1987
EIR

EL DORADO HILLS

OPEN SPACE MAP

FIGURE 2-10. OPEN SPACE MAP

Owner	Land Planner
El Dorado Hills Investors, Ltd	Anthony M. Guzzardo and Associates, Inc.
3864 Park Drive, Suite 204 El Dorado Hills, California	836 Montgomery Street San Francisco, California

ATTACHMENT 6

EDHSP OCTOBER 1987

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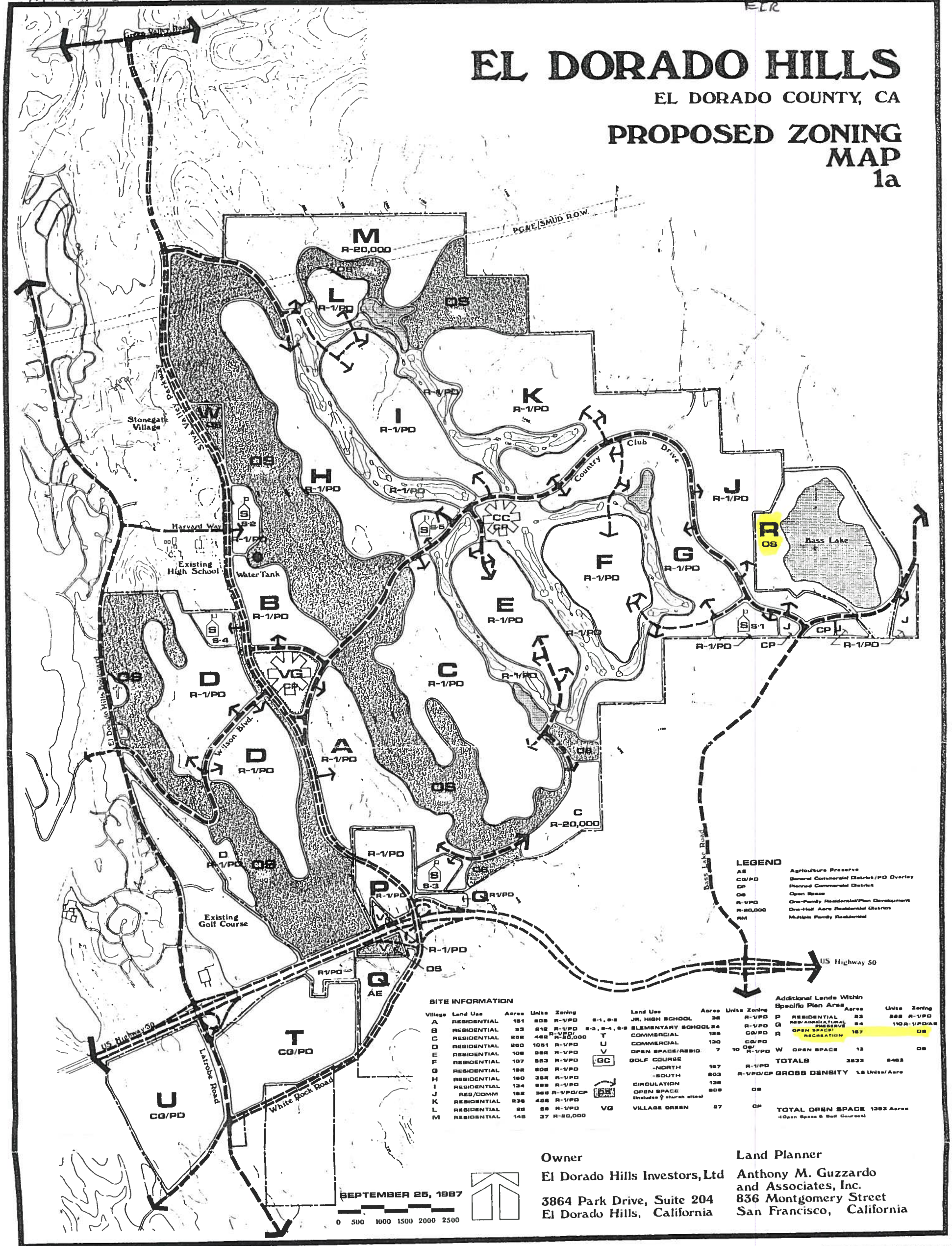
ELR

EL DORADO HILLS

EL DORADO COUNTY, CA

PROPOSED ZONING MAP 1a



LEGEND

AE	Agriculture Preserve
CG/PD	General Commercial District/PD Overlay
CP	Planned Commercial District
OS	Open Space
R-1/PD	One-Family Residential/Plan Development
R-20,000	One-Half Acre Residential District
RM	Multiple Family Residential

SITE INFORMATION

Village	Land Use	Acres	Units	Zoning	
A	RESIDENTIAL	151	505	R-1/PD	S-1, S-5
B	RESIDENTIAL	53	212	R-1/PD	S-3, S-4, S-5
C	RESIDENTIAL	282	462	R-1/PD/ R-20,000	T
D	RESIDENTIAL	250	1051	R-1/PD	U
E	RESIDENTIAL	108	382	R-1/PD	V
F	RESIDENTIAL	107	553	R-1/PD	GC
G	RESIDENTIAL	192	608	R-1/PD	
H	RESIDENTIAL	160	362	R-1/PD	
I	RESIDENTIAL	134	555	R-1/PD	
J	RES/COMM	162	369	R-1/PD/CP	55 Acres
K	RESIDENTIAL	236	456	R-1/PD	
L	RESIDENTIAL	88	88	R-1/PD	VG
M	RESIDENTIAL	146	37	R-20,000	

Land Use	Acres	Units	Zoning
JR. HIGH SCHOOL	36		R-1/PD
ELEMENTARY SCHOOL	24		R-1/PD
COMMERCIAL	126		CG/PD
COMMERCIAL	130		CG/PD
OPEN SPACE/RESID.	7	10	CG/ R-1/PD
GOLF COURSE -NORTH	187		R-1/PD
-SOUTH	203		R-1/PD/CP
CIRCULATION	138		
OPEN SPACE (includes ½ church sites)	208		OS
VILLAGE GREEN	27		CP

Additional Lands Within Specific Plan Area

		Acres	Units	Zoning
P	RESIDENTIAL	53	208	R-1/PD
Q	RES/AGRICULTURAL PRESERVE	84	110	R-1/PD/AE
R	OPEN SPACE/ RECREATION	187		OS
W	OPEN SPACE	13		OS
	TOTALS	3833	8483	
	GROSS DENSITY	1.8 Units/Acre		

TOTAL OPEN SPACE 1363 Acres
(Open Space & Golf Courses)

SEPTEMBER 25, 1987

0 500 1000 1500 2000 2500

Owner

El Dorado Hills Investors, Ltd

3864 Park Drive, Suite 204
El Dorado Hills, California

Land Planner

Anthony M. Guzzardo and Associates, Inc.
836 Montgomery Street
San Francisco, California

FIGURE 4-3.
PROPOSED ZONING MAP

c. All exterior lighting fixtures shall be efficient in terms of design and energy use. Low- and high-pressure sodium (LPS and HPS) lamps are recommended in public areas but prohibited on structures.

d. Lighting fixtures within the Village Green/Community Center shall be designed to deflect light and glare away from the viewsheds of adjacent residences, parks, and open space. Fixture placements are to be approved by the ACC. Cutoff-type fixtures are recommended to minimize light spillage and glare.

e. All electrical, telephone, and other cable services shall be installed underground. Transformers, terminal boxes, meter cabinets, pedestals, concealed ducts, and other facilities necessary and appurtenant to underground facilities, street lighting, and the irrigation system may be placed above ground when necessary. Public utilities may be provided in private streets with recorded easements to ensure access as required for their maintenance.

Section 5.0 Open Space, Parks and Recreation, Trails and Paths

Integral to the concept of the El Dorado Hills Specific Plan is the mixture of open space, residential areas, commercial sites, and circulation. The success of this integration depends primarily on the manner in which the boundaries between these various land uses meet and interconnect. This section establishes guidelines to facilitate these interconnections and especially to protect the natural open space from impacts from adjacent uses.

5.1 Open Space

Five basic types of open space are provided in the Plan Area: natural open space, golf course, residential open space, parkland and school playfields, and drainageways.

5.2 Natural Open Space

a. Natural open space, as designated in the Specific Plan, will be preserved in perpetuity in an essentially unaltered condition.

b. No development will occur within these areas except for maintenance, fire protection, trails, and permitted uses.

c. Use will be restricted to such activities as jogging, hiking, and horseback riding, where the impact on the natural environment will be minimal.

5.3 Golf Course

a. With the exception of the clubhouse, pro shop facilities, and commercial uses, all of the area designated as the golf course will be landscaped and developed exclusively for golf and country club-related facilities.

b. Swales and drainageways will be landscaped, where possible, using native planting to enhance the natural habitat.

5.4 Residential Open Space

a. Open space easement dedications on individual residential parcels may be required in order to reduce fence visibility, reduce open space intrusion, buffer open space from development, and reduce tree loss.

b. Such easements may be required to prevent development of other than accessory structures and landscaping.

c. General public access rights will not be permitted within these easements.

canopies dominated by interior live oak, blue oak, and buckeye. Occasional valley oak, cottonwood, California grape, and willow are scattered, but rare, along these creeks. Two small sites along Allegheny Creek have notable stands of cottonwood/willow/Himalaya-berry vegetation (Figure 12-1). The presence of the two stands of riparian-dependent vegetation and the occasional valley oaks, cottonwoods, and willows along the rest of the creek, indicates that Allegheny Creek may be capable of supporting more extensive riparian-dependent vegetation.

Carson Creek supports an intermediate type of creekside vegetation with the riparian dependent cottonwood, willow, and buttonbush species mixing with interior live oak, blue oak, and buckeye. The canopy is nearly closed and riparian-dependent species contribute about 40 percent of total cover. Because water is present most or all of the year, riparian herbs such as beardgrass, deer grass, and spike rush are also present. The channel is very rocky with numerous large boulders and bedrock outcrops. These features reduce accessibility to livestock and may account for the increased amount of riparian-dependent vegetation.

The north branch of Carson Creek that drains Bass Lake has considerably less riparian-dependent vegetation than the main branch. Willows and buttonbush are only occasionally present with interior live oak and buckeye the most common species along the creek edges; reaches with annual grasslands and no woody vegetation are common. Compared with the main branch, this branch has less water and is more accessible to livestock because the large bedrock exposures and boulders are absent. These characteristics may help to explain the lower amounts of riparian-dependent vegetation.

The creekside habitat with the most highly developed stand of riparian-dependent vegetation is west of the Plan Area along the small unnamed creek flowing through the existing golf course. This creek has a small watershed and no surface flow was observed above the golf course. The creek's vegetation consists of a 40- to 50-foot tall canopy of young cottonwoods, a dense mid-story layer of various willow species and alders, and a dense impenetrable understory of Himalaya berry, wild grape, and poison oak. Golf course irrigation probably augments natural creek discharge. This feature, and the absence of livestock grazing, probably account for the well-developed young stand of riparian vegetation. Presumably, this riparian-dependent vegetation was not present before the golf course increased creek discharge and the livestock grazing was terminated.

Wildlife

Allegheny Creek has few of the wildlife values usually associated with creekside habitats because of the effects of livestock grazing and past mining activities and because of its intermittent water flow. In general, the corridor along

ATTACHMENT 9

EDUSP SECTION – RESIDENTIAL LAND USE 261017

VILLAGE "I"

Village "I" is encircled by the proposed golf course and may include a country club and related facilities. It is an area characterized by lower elevations and gentle slopes, and is located in the center of the development neighborhood. As a result, the outer boundaries of Village "I" are appropriate for Attached Golf Townhomes (AGT) and Fairway Estates (FE). The interior portions of the village, with more level topography, are appropriate locations for Single Family Detached (SFD) homes.

This village is also planned to include a neighborhood park, the location of which will be determined with the filing of a tentative subdivision map for this village. Village "I" would accommodate approximately 699 dwelling units.

VILLAGE "K"

Village "K" is defined by the northeast boundaries of the Specific Plan area, the golf course on the west, and the main east-west arterial (Country Club Drive) to the south. The village contains significant tree cover and includes a knoll which offers panoramic views of the Sacramento Valley, Folsom Lake, and the Sierra Nevada. Subdivision design and placement of structures will be subject to design review to preserve as many of the existing live oaks within this village as possible.

The eastern edge of Village "K" abuts the existing rural parcels of Green Springs Estates, and therefore the lower density Ranch Estate (RE) lots act as a transition between those existing rural lots outside of the Plan Area and the Estate Home (EH) lots located toward the interior of the village. Westerly facing slopes fronting on the golf course are appropriate locations for the lower density View Estates (VE). Single Family Detached (SFD) residences are proposed along Country Club Drive and along the golf course frontage where the topography would not accommodate attached dwelling units. This development pattern would permit Village "K" to accommodate approximately 458 dwelling units.

VILLAGE "J"

Village "J" is bounded on the northeast by the exterior of the Specific Plan area and on the south by Country Club Drive. It includes Bass Lake Road and the Bass Lake water reservoir, which is designated as open space.

This village is not adjacent to a golf course or Specific Plan open space areas and contains level to gently rolling topography. The latter characteristic lends itself to Single Family Detached (SFD) uses, except at the edges adjacent to rural parcels or Bass Lake where larger Ranch Estate (RE) lots are provided. Specifically, parcels that abut the Plan Area boundary are to be 4-acre minimum. These designations are appropriate as a buffer to the open space of Bass Lake and the rural parcels lying adjacent to, but outside of, the Specific Plan area to the east.

Village "J" also includes 45 acres of neighborhood commercial sites on the west and east sides of Bass Lake Road. These uses are intended to serve the daily shopping needs of future residents in the vicinity. Village "J" would accommodate approximately 342 dwelling units.

VILLAGE "L"

Village "L" represents the smallest village in the Specific Plan area, constituting an island of development surrounded by natural open space or a golf course. With its heavy tree cover and location on a prominent knoll, the site is established as a separate, unique village, and the larger Estate Home (EH) lots are appropriate. A low-lying area east of the village is designated for a future water retention pond to accommodate drainage in the area. This lake also provides an accessible water amenity within the North Uplands Golf Course Neighborhood. Village L is appropriate for only 56 dwelling units.

ATTACHMENT 10

EDHSP DRAFT EIR
OCTOBER 1987
CHAPTER 12, PAGE 12-11
VEGETATION, WILDLIFE
AND AQUATIC

261017

Wildlife - Stockponds

Stockponds in the Plan Area are similarly degraded by livestock grazing. These turbid ponds may provide resting and foraging grounds for mallards and great blue herons and are also a source of water for mule deer and other mammals and birds. The wildlife value of the stockponds is substantially reduced because they lack riparian or emergent vegetation.

Bass Lake (approximately 154 acres)

A large year-round lake at the east edge of the Plan Area has special value as wildlife habitat.

Vegetation

Vegetation at Bass Lake consists of a few scattered cottonwoods and willow trees and herbaceous species listed previously for the freshwater marshes and seep habitats.

Wildlife

Because of its fluctuating water levels, Bass Lake does not support any important stands of emergent or riparian vegetation, but it does provide foraging and resting grounds for a variety of waterfowl. Common mergansers, ruddy ducks, buffleheads, and American wigeons use Bass Lake in the winter. Great blue herons, great egrets, and killdeer forage along the muddy margins of the lake, and black phoebes, tree and violet-green swallows flycatch for insects above the lake's waters. Bass Lake is also a source of water for mammals like raccoons, striped skunks, and mule deer.

Serpentine Chaparral (approximately 39 acres)

A small area with serpentine substrates and derived soils is present along the east edge of the Plan Area east and adjacent to Bass Lake. Serpentine substrates are common east and north of the Plan Area (Rogers 1974).

Soils derived from serpentines are nutritionally poor and present a stressful habitat for plant growth due to the presence of toxic metals and thin soils. As a result, the vegetation differs in structure and composition from surrounding non-serpentine substrates.

Serpentine is famous in California because many special-status plant species are restricted to the substrate. In El Dorado County eight special-status species are associated with serpentine and the related gabbro substrates (Wilson 1986, Smith and York 1984). None of these species occur in the Plan Area on

PRESERVATION OF OPEN SPACE

GOAL 7.6: OPEN SPACE CONSERVATION

Conserve open space land for the continuation of the County's rural character, commercial agriculture, forestry and other productive uses, the enjoyment of scenic beauty and recreation, the protection of natural resources, for protection from natural hazards, and for wildlife habitat.

OBJECTIVE 7.6.1: IMPORTANCE OF OPEN SPACE

Consideration of open space as an important factor in the County's quality of life.

Policy 7.6.1.1 The General Plan land use map shall include an Open Space land use designation. The purpose of this designation is to implement the goals and objectives of the Land Use and the Conservation and Open Space Elements by serving one or more of the purposes stated below. In addition, the designations on the land use map for Rural Residential and Natural Resource areas are also intended to implement said goals and objectives. Primary purposes of open space include:

A. Conserving natural resource areas required for the conservation of plant and animal life including habitat for fish and wildlife species; areas required for ecologic and other scientific study purposes; rivers, streams, banks of rivers and streams and watershed lands;

B. Conserving natural resource lands for the managed production of resources including forest products, rangeland, agricultural lands important to the production of food and fiber; and areas containing important mineral deposits;

C. Maintaining areas of importance for outdoor recreation including areas of outstanding scenic, historic and cultural value; areas particularly suited for park and recreation purposes including those providing access to lake shores, beaches and rivers and streams; and areas which serve as links between major recreation and open space reservations including utility easements, banks of rivers and streams, trails and scenic highway corridors;

D. Delineating open space for public health and safety including, but not limited to, areas which require special management or regulation because of hazardous or special conditions such as earthquake fault zones, unstable soil areas, flood plains, watersheds, areas presenting high fire risks, areas required for the protection of water quality and water reservoirs, and areas required for the protection and enhancement of air quality; and

E. Providing for open spaces to create buffers which may be landscaped to minimize the adverse impact of one land use on another.

ATTACHMENT 12

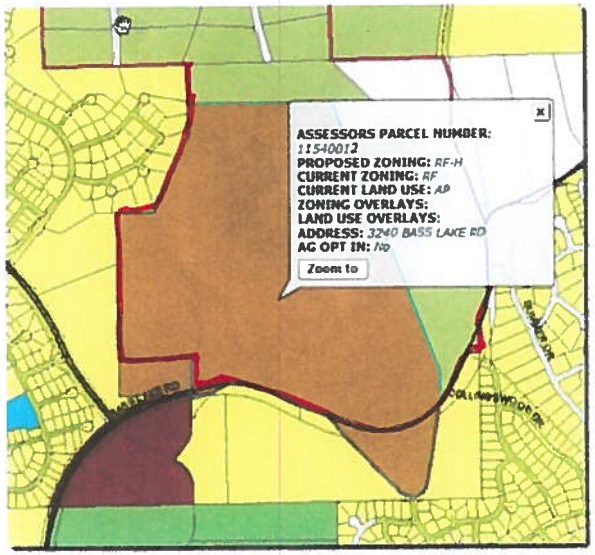
Table 2-2 General Plan Land Use Designation and Zone Consistency Matrix

Zones	Land Use Designations											
	MFR	HDR	MDR	LDR	RR	AL	NR	C	R&D	I	OS	TR
RM	•							•[1]				
R1		•	Δ									
R20K		•										
R1A		•	•									
R2A			•									
R3A			•									
RE (5-10)			•	•	•[2]							
CPO								•				
CL								•				
CM								•				
CC								•				
CR								•				
CG								•				
I										•		
R&D									•			
LA (10-160)				•[4]	•	•	•				•[3]	
PA (10-160)				•[4,★]	•	•	•				•[3]	
RL (10-160)				•[4]	•	•	•				•[3]	
AG (40-160)				★	•	•	•				•[3]	★
FR					•	•	•					
TPZ				•	•	•	•					
RFL	•	•	•	•	•		•				•	•
RFH	•	•						•			•[5]	•
TC	•	•	•	•	•	•	•	•	•	•	•	•
OS	•	•	•	•	•	•	•				•	•

NOTES:

Land Use Designations

- C = Commercial
- R&D = Research & Development
- HDR = High-Density Residential
- I = Industrial
- LDR = Low-Density Residential
- MDR = Medium-Density Residential
- MFR = Multifamily Residential
- NR = Natural Resource
- OS = Open Space
- RR = Rural Residential
- AL = Agricultural Lands
- TR = Tourist Recreational



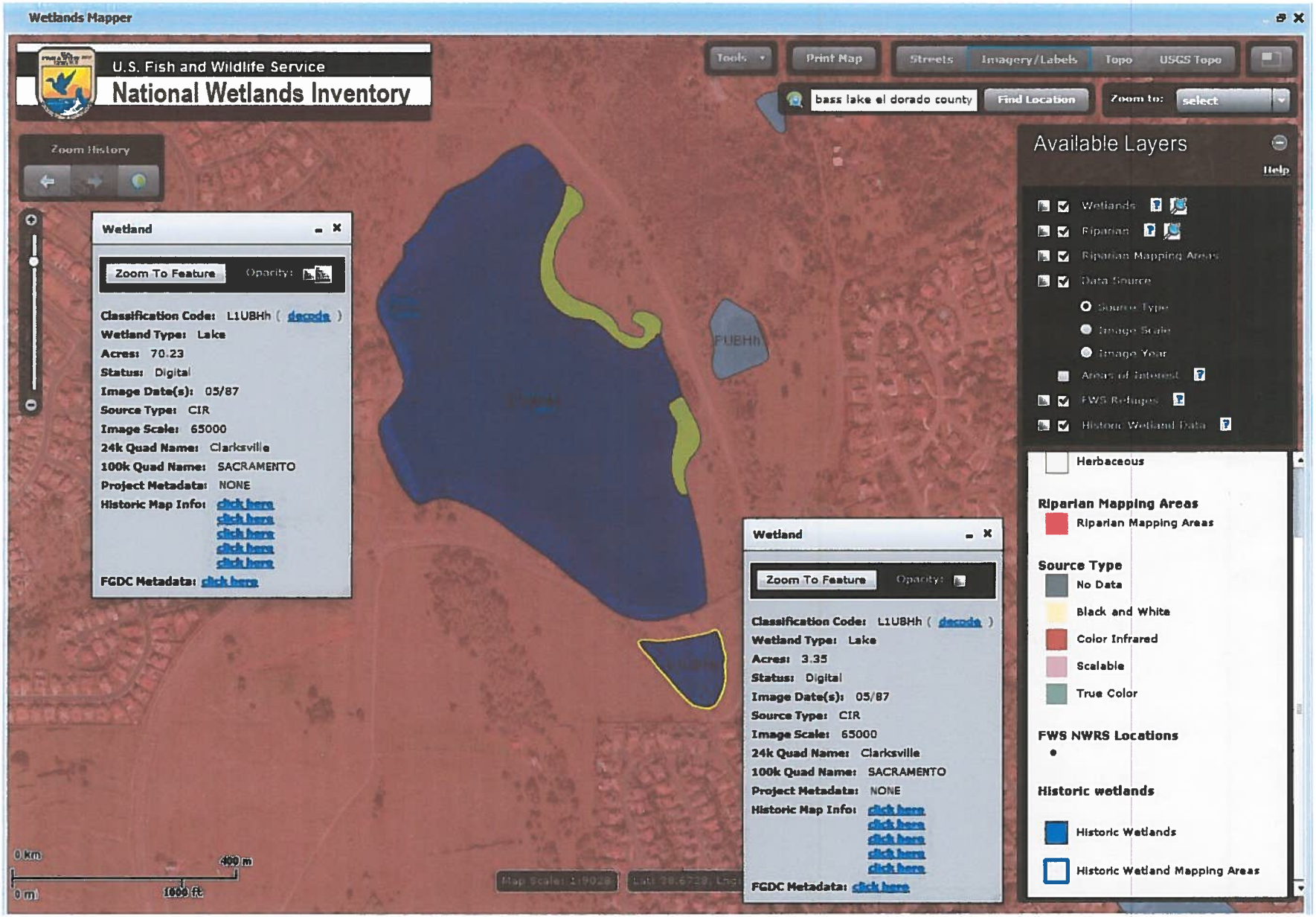
Footnote (5) on the next page: "*When inside a Community Region*".

261017

PROJECT DESCRIPTION
DRAFT EIR

7/20/2014 7:50 A

ATTACHMENT 13-1



261017

ATTACHMENT 13-2

Enter Classification code: (Example: **L1UB1Hx**)

For geographically specific information* (optional), please enter a State code: (Example: **TX** for Texas)

DECODE

Description for code **PEMFh** :

P System **PALUSTRINE**: The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 ppt. Wetlands lacking such vegetation are also included if they exhibit all of the following characteristics: 1. are less than 8 hectares (20 acres); 2. do not have an active wave-formed or bedrock shoreline feature; 3. have at low water a depth less than 2 meters (6.6 feet) in the deepest part of the basin; 4. have a salinity due to ocean-derived salts of less than 0.5 ppt.

Subsystem :

EM Class **EMERGENT**: Characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants.

Subclass :

Modifier(s):

F WATER REGIME **Semipermanently Flooded**: Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land's surface.

h SPECIAL MODIFIER **Diked/Impounded**: These wetlands have been created or modified by a man-made barrier or dam which obstructs the inflow or outflow of water. The descriptors 'diked' and 'impounded' have been combined into a single modifier since the observed effect on wetlands is similar. They have been combined here due to image interpretation limitations. For clarification of the extent of impoundment see discussion of Lacustrine System limits.

ca Plant Specie(s):

Scientific Name	Common Name	Indicator	Reference Info.

ca Soil(s):

Series	Subgroup	Soils Fields Ind.	Drainage Class	Flood Frequency	Flood Duration	Flood Latest	HWT Depth	HWT Latest	LRR	Soil-5 Code

ATTACHMENT 13-3

261017

Enter Classification code: (Example: **L1UB1Hx**)

For geographically specific information* (optional), please enter a State code: (Example: **TX** for Texas)

DECODE

Description for code **L1UBHh** :

L System **LACUSTRINE**: The Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics: 1. situated in a topographic depression or a dammed river channel; 2. lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage; 3. total area exceeds 8 hectares (20 acres).

1 Subsystem **LIMNETIC**: Extends outward from Littoral boundary and includes all deep-water habitats within the Lacustrine System.

UB Class **UNCONSOLIDATED BOTTOM**: Includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%.

Subclass :

Modifier(s):

H WATER REGIME **Permanently Flooded**: Water covers the land surface throughout the year in all years.

h SPECIAL MODIFIER **Diked/Impounded**: These wetlands have been created or modified by a man-made barrier or dam which obstructs the inflow or outflow of water. The descriptors 'diked' and 'impounded' have been combined into a single modifier since the observed effect on wetlands is similar. They have been combined here due to image interpretation limitations. For clarification of the extent of impoundment see discussion of Lacustrine System limits.

ca Plant Specie(s):

Scientific Name	Common Name	Indicator	Reference Info.

ca Soil(s):

Series	Subgroup	Soils Fields Ind.	Drainage Class	Flood Frequency	Flood Duration	Flood Latest	HWT Depth	HWT Latest	LRR	Soil-5 Code

ATTACHMENT 14-1

261017

REVISED 6/16/03

STATE OF CALIFORNIA - THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME
SACRAMENTO VALLEY AND CENTRAL SIERRA REGION
1701 NIMBUS ROAD, SUITE A
RANCHO CORDOVA, CALIFORNIA 95670
Telephone (916) 358-2900

GRAY DAVIS, Governor

Flex your POWER

June 12, 2003

Mr. Gary Hyden
El Dorado County
2000 Fairlane Court
Placerville, CA 95667

Dear Mr. Hyden:

The Department of Fish and Game (DFG) has reviewed the May 16, 2003 Notice of Preparation (NOP) of a draft Environmental Impact Report (DEIR) for the Bass Lake Regional Park (SCH 2003052077). Project plans for the 41-acre park site include development of a golf course, baseball diamond, soccer field, and other facilities. The project site is immediately adjacent to Bass Lake, near Bass Lake Road and south of Green Valley Road, in western El Dorado County.

Bass Lake and the surrounding shoreline, including lands within the proposed park site, are valuable habitat areas for resident and migratory bird. At least one bald eagle (*Haliaeetus leucocephalus*) has been a frequently observed winter visitor there in recent years, and has often been observed along the shoreline near or inside of the boundaries of the proposed park. Also, Bass Lake is a valuable feeding and resting area for wintering waterfowl, including ring-necked duck (*Athya collaris*), mallard (*Anas platyrhynchos*) northern shoveler (*Anas clypeata*) and other species. Other aquatic bird species present at Bass Lake include western grebe (*Aechmophorus occidentalis*) and great egret (*Ardea herodias*). Bird species found in grassland areas near Bass Lake include lark sparrow (*Chondestes grammacus*), western meadowlark (*Stenella neglecta*), and western kingbird (*Tyrannus verticalis*). All of the aforementioned bird species have been documented on or adjacent to Bass Lake by Mr. Frank Gray, Biologist of my staff.

Development of ball fields, a golf course, nature interpretation facilities, a community center, pathways, and other facilities, as well as the associated human use, can be expected to greatly reduce resident and migratory bird use of the area. Besides the direct permanent removal of habitat from project construction, many of the bird species are very sensitive to human disturbances which can be expected from operation of the park. For example, the development and use of a perimeter trail

(NOP Item #16, Figure 2) has the potential to significantly affect foraging areas for birds, such as the bald eagle, great egret, and many species of waterfowl.

The DFG has documented many fish species in Bass Lake. Species include largemouth bass (*Micropterus salmoides*), redear sunfish (*Lepomis microlophus*), channel catfish (*Ictalurus punctatus*), and other species. There is potential for runoff from parking areas and construction sites that contain substances deleterious to aquatic life. The risk for this runoff entering Bass Lake and its effect on fish and other aquatic life should be analyzed in the DEIR. Also, bulrushes, cattails, and submerged portions trees are important habitat and escape cover for these and other fish species and should be retained.

In addition to addressing these issues, the DEIR should address the following:

1. Baseline Habitat Species Inventory/Habitat Mapping – A comprehensive inventory of all bird, mammals and other animals, and plant species known or likely to occur at the 41-acre project site and at Bass Lake should be provided. Full species lists should be included in the Appendices of the DEIR. Habitat types of the subject areas should also be identified and mapped in the DEIR. This should include the acreage and location of the existing pond and associated wetlands on the 41 acre property. All grasslands on the 41-acre site should also be mapped and described, as well as the specific location, area, species composition, and other information of existing large willow trees and other plants bordering that part of Bass Lake nearest to the 41-acre property.

Surveys should be conducted at the time of year when rare, threatened, or endangered species are both evident and identifiable. Field surveys should be scheduled to coincide with the appropriate breeding or other life history stage of animals and when they are likely to be evident. Also, surveys should coincide with peak flowering periods and/or during periods of phenological development that are necessary to identify a plant species of concern. Maps and other relevant information regarding rare or listed species may be obtained from the DFG Natural Diversity database for a nominal fee by calling (916) 324-3812.

2. Project Impacts - Analyze and discuss project impacts on the DEIR and all reasonably foreseeable direct, indirect and cumulative project-related impacts on the 41 acre project site and nearby areas, including Bass Lake. Project impacts to native plants should be included in the analysis. A list of all individual trees to be removed should be provided, or the acreage of trees and shrubs to be removed if such removal involves clumps of small trees. The project should be designed so that impacts to these resources are avoided. The DEIR should address the project's impact on species identified as rare, threatened, or endangered.

Any activity should be addressed that may result in loss of habitat, decreased reproductive success, or other negative effects on population levels of rare, threatened, or endangered species. Mitigation should be provided which reduces project impacts to a level less than significant, if it is not possible to avoid impacts.

3. Fragmentation – The DEIR should evaluate the project's contribution to habitat fragmentation, population isolation, and decreased habitat connectivity for all plant and animal populations, including state and federal listed species and species of concern.

4. Mitigation/Monitoring - Identify and discuss feasible mitigation measures. This should include a mitigation plan for removal of trees associated with the project, including but not limited to oak trees, foothill pines, willows, and other species. Mitigation should be provided for unavoidable impacts based upon the concept of no-net-loss of habitat values or acreage. A monitoring program should be implemented for all mitigation activities, as consistent with CEQA Guidelines Section 15097. This program should be described in the DEIR.

A timetable for achieving the mitigation should be provided. Priority should be given to mitigation measures designed to avoid project- related impacts, followed by mitigation measures that will substantially lessen such impacts. Specifically, identify mitigation measures that minimize and fully mitigate all project impacts to state and federal listed species. Specific project level analysis should identify both on-site mitigation achieved through project design, take avoidance measures, and any potential off-site mitigation strategies.

5. Consistency - Evaluate the project's consistency with the applicable local and regional land use plans such as General Plans, Watershed Plans, Habitat Conservation Plans and U.S. Fish and Wildlife Service Biological Opinions.

6. Project Alternatives - discuss and include alternatives in development design for the project that will avoid or substantially lessen project-related impacts on biological resources. Alternative designs should include avoidance of all significant habitats and listed species and species of concern and include design concepts that address habitat connectivity, fragmentation and population isolation.

It is likely that a Fish and Game Code 1601 or 1603 agreement will be required for various elements of park construction. This is particularly true with respect to modifications of the shoreline of the existing large pond on the project site. In general, an agreement is applicable whenever a proposed project involves work undertaken in or near a river, stream, or lake that flows at least intermittently through a bed or channel,

including ephemeral streams and water courses. Impacts triggering regulation by the DFG under these provisions of the Fish and Game Code typically result from activities that:

- Divert, obstruct, or change the natural flow or the bed, channel or bank of a river, stream, or lake;
- Use material from a streambed; or
- Result in the disposal or deposition of debris, waste, or other material where it may pass into a river, stream, or lake.

In the event implementation of the proposed project involves such activities, and those activities will result in reasonably foreseeable substantial adverse effects on fish or wildlife, a Lake or Streambed Alteration Agreement (LSAA) will be required by the DFG. The DEIR should analyze whether the potentially feasible mitigation measures set forth below will avoid or substantially reduce impacts requiring a LSAA from the DFG.

1. Protection and maintenance of the riparian, wetland, stream or lake systems to ensure a "no-net-loss" of habitat value and acreage. Plant removal should not exceed the minimum necessary to complete operations.
2. Provisions for the protection of fish and wildlife resources at risk that consider various life stages, maintain migration and dispersal corridors, and protect essential breeding (i.e. spawning, nesting) habitats.
3. Delineation of buffers along streams and wetlands to provide adequate protection of the aquatic resource. No grading or construction activities should be allowed within these buffers.
4. Placements of construction materials, spoil, or fill, so that they cannot be washed into Bass Lake or other waters of the State.
5. Prevention of downstream sedimentation and pollution. Provisions may include but not be limited to oil/grit separators, detention ponds, buffering filter strips, silt barriers, etc., to prevent downstream sedimentation and pollution.

Restoration plans must include performance standards such as the types of vegetation to be used, the timing of implementations, and contingency plans if the replanting is not successful. Restoration plans of disturbed areas should use native plants.

14-5

261017

Finally, in the event implementation of the proposed project will involve activities and impacts requiring a LSAA, please contact the Sacramento Valley-Central Sierra Region for a notification packet and fee schedule.

This project will have an impact to fish and/or wildlife habitat. Assessment of fees under Public Resources Code Section 21089 and as defined by Fish and Game Code Section 711.4 is needed. Fees are payable by the project applicant upon filing of the Notice of Determination by the lead agency

Pursuant to Public Resources Code Sections 21092 and 21092.2, the DFG requests written notification of proposed actions and pending decisions regarding this project. Written notifications should be directed to this office.

Thank you for the opportunity to review this project. If the DFG can be of further assistance, please contact Mr. Frank Gray at (916) 358-2883 or Ms. Terry Roscoe, Habitat Conservation Planning Supervisor, at (916) 358-2382.

Sincerely,

Larry L. Eng. Ph.D.
Deputy Regional Manager

FG:js

cc: Mr. Phil Dunn
C/o EDAW
2022 J Street
Sacramento, CA 95814

Mr. Peter Epanchin
U.S. Fish and Wildlife Service
Forest Foothill Branch
2800 Cottage Way, Room W-2605
Sacramento, CA 95825

Alice Q. Howard
Conservation Chair, Maidu Chapter
Sierra Club
1487 Crooked Mile Ct.
Placerville, CA 95667

cc: Ms. Mary Bisharat
Conservation Chair
Sacramento Audubon Society
2110 Boyer Drive
Carmichael, CA 95608

Mr. Dave Witter
Director of Water Policy Coordination
El Dorado Irrigation District
2890 Mosquito Road
Placerville, CA 95667

Ms. Terry Roscoe
Mr. Jason Holley
Mr. Stafford Lehr
Department of Fish and Game
Sacramento Valley - Central Sierra Region
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670

14-7

Gray/pg

Draft Approved by

T. Roscoe 6/10/03

S. Wick 6/10/03 out

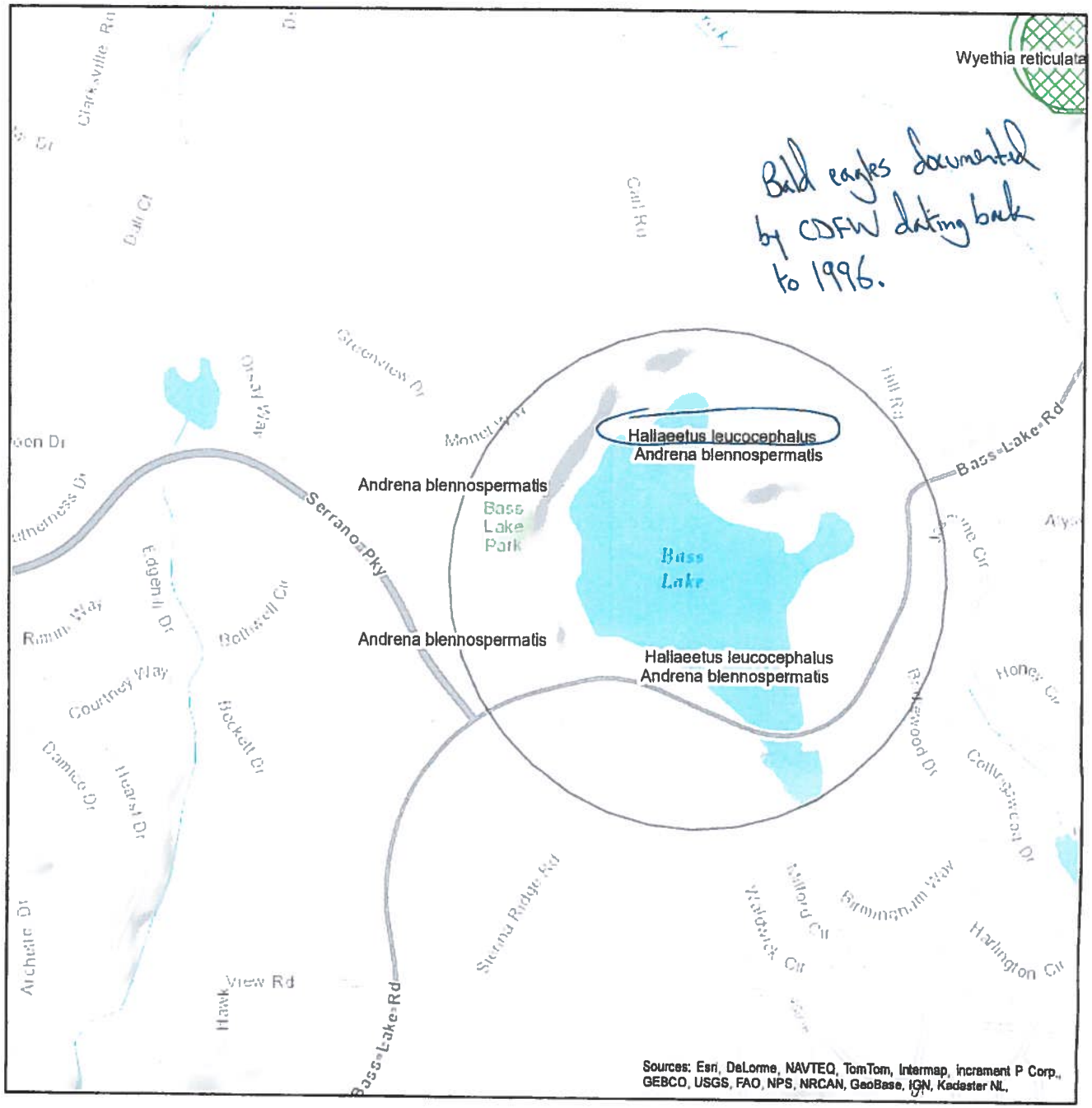
File: ES Chron, RF
a: gray 2003/Hyden/BassLake RegParkNOP0503/pg

Surname					
		6/12/03			

261017

Bass Lake CNDDB report

- Plant (80m)
- Plant (specific)
- Plant (non-specific)
- Plant (circular)
- Animal (80m)
- Animal (specific)
- Animal (non-specific)
- Animal (circular)
- Terrestrial Comm. (80m)
- Terrestrial Comm. (specific)
- Terrestrial Comm. (non-specific)
- Terrestrial Comm. (circular)
- Aquatic Comm. (80m)
- Aquatic Comm. (specific)
- Aquatic Comm. (non-specific)
- Aquatic Comm. (circular)
- Multiple (80m)
- Multiple (specific)
- Multiple (non-specific)
- Multiple (circular)



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February 18, 2014

Author: pmoeszinger

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14-8

ATTACHMENT 15

DRAFT EIR - BASS LAKE ROAD REALIGNMENT FEBRUARY 1992 (NOW CALLED SILVER SPRINGS PARKWAY

264017

American River College
4700 College Oak Dr.
Sacramento. CA. 95841

12-27-[illegible]

El Dorado County of Transportation
2441 Headington Rd.
Placerville. CA. 95667
Attn: Mr. Kris Payne

Dear Sir,

It has come to my attention that a development is planned near Bass Lake in your county. I also understand that it was not clear whether there are wintering Bald Eagles at that Lake.

I have been a professor at American River College for forty-three years and teach natural history, conservation and ornithology. I am also a past president of the Sacramento Audubon Society.

I have been aware of the wintering eagles at Bass lake for the last 40 years. I even use a picture of a bald eagle taken there in some of my lectures. I take my ornithology field classes to Bass Lake at least twice each year to see the eagles, waterfowl and other birds.

Any development in the area must recognize the presence of these birds or the Endangered Species Act will be violated. I hope your county will realize the tremendous resource a place like Bass Lake is. I implore the planning and administration units of El Dorado County to make wise and far-reaching decisions that will ensure the atmosphere of your county that people enjoy and appreciate will be preserved.

If I can help with any further information about the area in question, please let me know. If further evidence of the eagles' presence is needed, I can put you in contact with many individuals and organizations familiar with the lake.

Very truly yours.

D. Bruce Swinehart, Jr.
Biology Professor

cc. Eldorado County Planning Comission
Sacramento Audubon Society

Home # 487-2525

ATTACHMENT 16-1

DRAFT EIR BASS LAKE ROAD REALIGNMENT FEBRUARY 1992
NOW CALLED SILVER SPRINGS PARKWAY

261017

December 30, 1991

Mr. Kim Payne
El Dorado County D.O.T.
3441 Headington Road
Placerville, CA 95667

RECEIVED
DEC 30 1991
EL DORADO CO.
DEPT. OF TRANSPORTATION

Dear Mr. Payne.

Re: Bass Lake Road Realignment N.O.P.

I have reviewed the Notice of Preparation for the Bass Lake Road realignment and would like to offer some comments that should be addressed in the EIR.

1 Air Quality - there should be a discussion of the potential for creating serpentine dust which can be carcinogenic and any additional mitigation, including avoidance of serpentine outcrops to eliminate the potential for serpentine dust.

2. Noise - timing of construction should occur to avoid any negative effects on the bald eagles that winter at Bass Lake.

3 Biological Resources - the EIR should thoroughly discuss the potential direct and indirect and cummulative impact to bald eagles that winter at Bass Lake each year. My family and I have enjoyed watching the bald eagles at Bass Lake for the past four winters since moving to Rescue. We have corresponded with Dr Bruce Swinehart at American River College in Sacramento and have found that Dr. Swinehart has personally observed the bald eagles at Bass Lake

ATTACHMENT 16-2

261017

Mr. Kerrigan
December 30, 1991
Page 2

with the students for the past 40 years. Because the bald eagle is a state listed endangered species, any potential loss of habitat is a significant impact that should be thoroughly addressed in the EIR.

Direct impacts such as noise and construction activity during the events should be avoided. Indirect impacts of increased traffic on the realigned road should be evaluated. Cumulative impacts of increased development in the vicinity of Bass Lake ~~should~~ in response to the realigned road should also be addressed.

A study to evaluate the significance of the potential loss of Bass Lake as bald eagle wintering habitat should be undertaken by El Dorado County D.O.T. in addition to the other project proponents proposing projects in the Bass Lake area. The California Department of Fish and Game and the U.S. Fish and Wildlife Service should be consulted to determine the appropriate design of such a study.

Please call me at work 653-6525 or home 677-1491 if you would like to discuss these comments further.

Sincerely,

Roger E. Johnson

Roger E. Johnson
2703 Meadow Lane
Rescue, CA 95672

ATTACHMENT 17

261017

ATTACHMENT 18-1

Environmental Impacts
Eagles/Pelicans at EID Bass Lake
Bass Lake Wetlands and Historic Wetlands

From SMUD:
The CNDDB (California Natural Diversity Data Base) reports that eagles have wintered at Bass Lake in western El Dorado County (T. 10 N., R. 9 E., S. 31, NE Qtr.; elevation 1,250 ft.) for over 40 years. Bass Lake is about 1.5 miles south of the UARP transmission line.
Residential development has been identified as a major concern to wintering eagles at Bass Lake. Here's the document:

http://hydrorelicensing.smud.org/docs/spr/6.1%20%20Bald%20Eagle%20and%20Osprey%20Study%20-%20PG020606.pdf

From Bass Lake Regional Park:
This above information was also reported by the California Dept. of Fish and Game when they commented on the EIR for the proposed Bass Lake Regional Park in 2002 - 2003. Since this was 10 years ago, the eagles would be in residence approximately 50 years at this time.

Bass Lake – From the Audubon Society:
Bass Lake is used to store water for the El Dorado Irrigation District. It is located on Bass Lake Rd. between Highway 50 and Green Valley Rd. Access to the lake is restricted but birds can be seen from roadside turnouts with binoculars or a spotting scope. Winter finds many waterfowl species here including Mallard, American Widgeon, Ring-necked Duck, Bufflehead, Canada Goose, and Greater White-fronted Goose. Other species seen here are Turkey Vulture, Wild Turkey, Great Blue Heron, Great Egret, Double-crested Cormorant, Killdeer, and Lark Sparrow.

In 2012 the Audubon Society reported that in 2011, eagles were spotted at Bass Lake when they did their December count.

Residents Observations:
Other birds noted at Bass Lake by local residents are several different kinds of hawks, American White Pelicans (for 10 years/see more information about them below) and a pair of swans who remained over the summer of 2013.

Recently a Golden Eagle was spotted around the EID Bass Lake property sitting on a pole and a Bald Eagle was seen by a nearby Serrano resident.

ATTACHMENT-18-2

Page 2 – Eagles at Bass Lake /Wetlands and Historic Wetlands

American White Pelicans

This species is protected by the Migratory Bird Treaty Act of 1918. It has the California Department of Fish and Game protective status California species of special concern (CSC). On a global scale however, the species is common enough to qualify as a Species of Least Concern according to the IUCN.[1]

Habitat loss is the largest known cause of nesting failure, with flooding and drought being recurrent problems. Human-related losses include entanglement in fishing gear, boating disturbance and poaching as well as additional habitat degradation.[9]

There was a pronounced decline in American White Pelican numbers in the mid-20th century, attributable to the excessive spraying of DDT, endrin and other organochlorides in agriculture as well as widespread draining and pollution of wetlands. But populations have recovered well after stricter environmental protection laws came into effect, and are stable or slightly increasing today. By the 1980s, more than 100,000 adult American White Pelicans were estimated to exist in the wild, with 33,000 nests altogether in the 50 colonies in Canada, and 18,500 nests in the 14–17 United States colonies. Shoreline erosion at breeding colonies remains a problem in some cases, as are the occasional mass poisonings when pesticides are used near breeding or wintering sites.

Bass Lake Wetlands/Historic Wetlands

The USGS National Wetlands Inventory map for the US Department of Fish and Wildlife Service has classified Bass Lake as a wetland and there are two historic wetlands on the east side of the lake. The link to this information is below.

http://mail.aol.com/38203-112/aol-6/en-us/mail/get-attachment.aspx?uid=29739912&folder=NewMail&partId=3&saveAs=basslake.png

18-3

261017

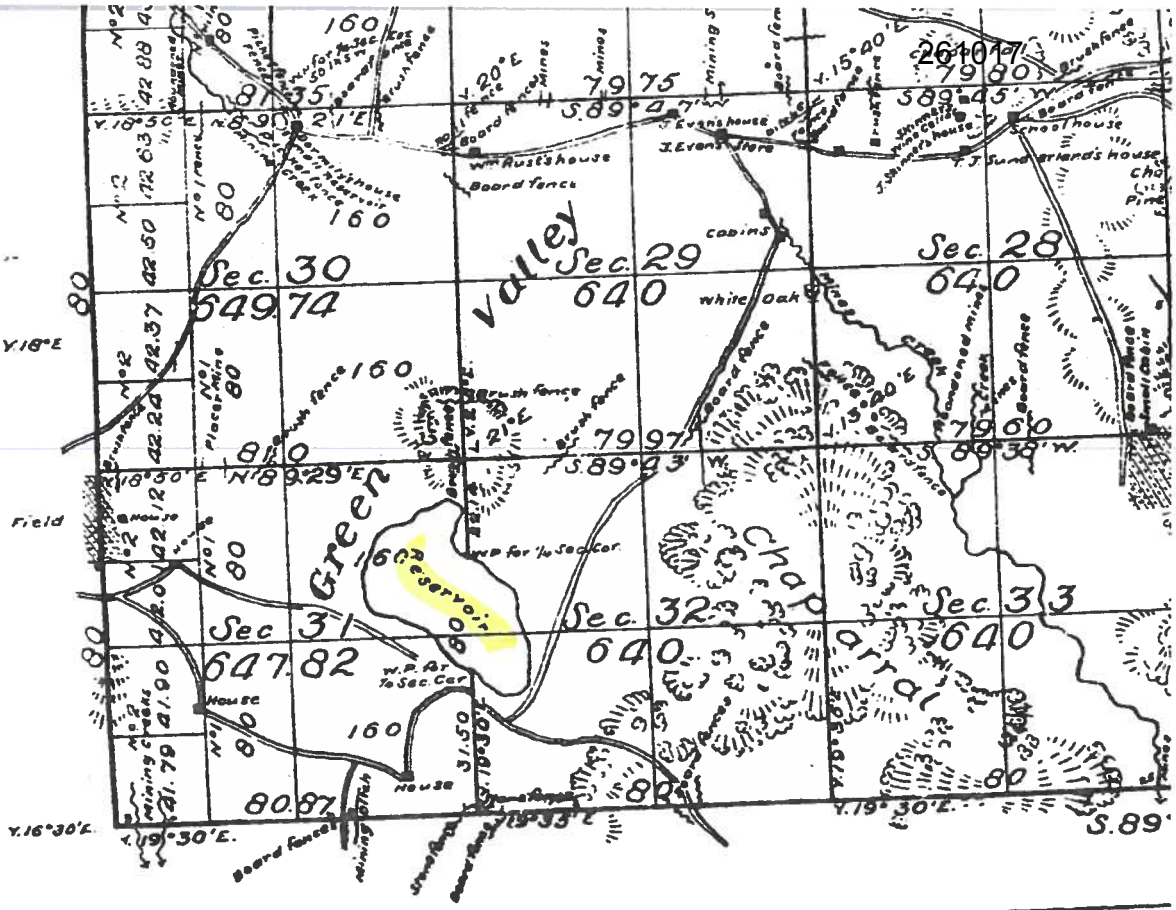
Swans at Bass Lake

ATTACHMENT 18-4

BASIC AND SUMMER DRIVE
BALD EAGLE
DECEMBER 2012
TAKEN BY JOE D'AMICO
(HAD BEEN EATING A FISH)

261017

ATTACHMENT 19



Surveys Designated	By whom Surveyed	Date of Contract
Part of west boundary of Township colored red	A. H. Jones	April 17th 1855
North boundary	J. E. Freeman	November 20th 1865
Rest of Township lines	" " "	" " "
Section lines	" " "	" " "

AMERICAN RESERVOIR
1865

SHAWNA PURVINES
SEPTEMBER 24, 2013
EMAIL TO ELLEN VANDYKE

ATTACHMENT 20 - 1
261017

Subject: Re: Bass Lake parcel 115-400-12

The Assessor Parcel Number (APN) 115-400-12 you have listed below is currently General Planned for Recreation within the El Dorado Hills Specific Plan (AP) and zoned Recreational Facilities (RF). Countywide, all currently zoned Recreational Facility (RF) parcels are being proposed for a rezone to either Recreational Facilities High (RFH) or Recreational Facilities low (RFL) consistent with General Plan objectives and based on current site location, uses or future planned site uses.

The El Dorado County Parks and Trails Master Plan was approved by the Board of Supervisors on March 27, 2012. This plan integrated a previous master plan developed for the Bass Lake Regional Park including APN 115-400-12. The Bass Lake Hills Regional Park was identified to potentially include intensive uses and amenities such as a community center, group picnic areas, basketball courts, a baseball field, toddler play area, playground, soccer field, dog park, disc golf, outdoor classroom, nature interpretive area, and parking.

Therefore, this site is proposed to be rezoned to Recreational Facilities High (RFH) consistent with the Board adopted Parks and Trails Master Plan.

Parcels within other Specific Plans may be proposed for revisions depending on the individual Specific Plan policies and requirements.

Shawna

ATTACHMENT 20-2

ATTACHMENT 21

2012 El Dorado County Parks Master Plan Final Approved

Bass Lake Regional Park

RP4. Bass Lake Regional Park

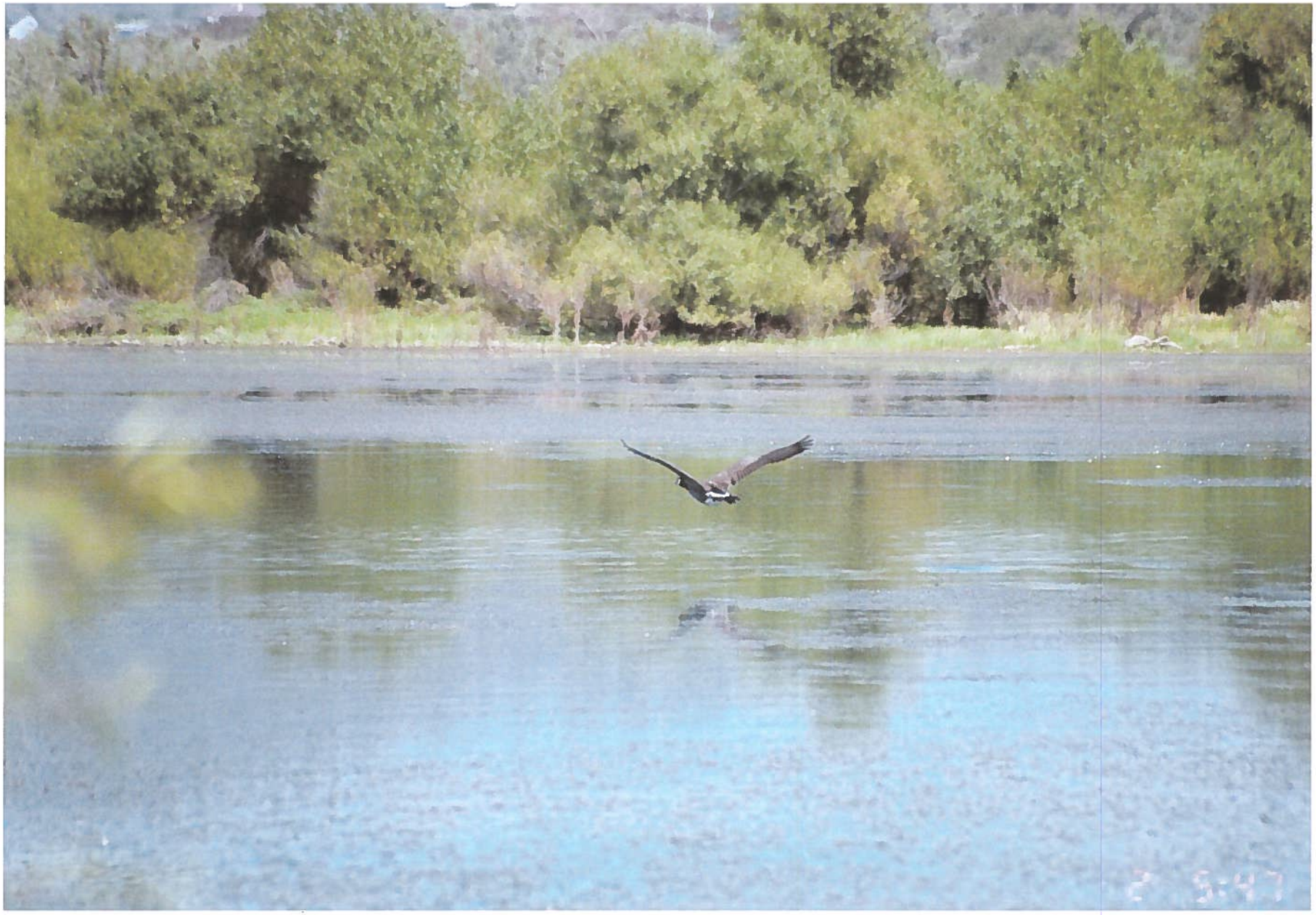
The County undertook a comprehensive planning effort in 2001 to 2003 to develop plans for the Bass Lake Regional Park. The proposed improvements include multiple lighted sports fields, picnic areas, a dog park, play areas, a community center, habitat areas, interpretive features, an outdoor classroom, and trails. During the EIR Notice of Preparation public scoping meeting in 2003 the community expressed concerns about the potential for the park as designed to adversely impact the neighbors and existing natural resource. A phased approach to the project was proposed, but has not moved forward due to budget and staffing issues. The concept plan is now 10 years old, and needs to be revisited taking into consideration new residential developments, local parks, and road projects in the area. On a regional basis, there continues to be a need for both soccer and baseball fields but the relative value of the other proposed improvements should be reexamined to reflect anticipated demographics and recreation preferences. More passive uses such as trails and nature areas may have greater value as the El Dorado Hills and Cameron Park communities are becoming more densely developed. These types of uses would also have fewer environmental impacts and cost less to develop and maintain. As a phased approach, the plan should scale back development of the active use facilities to focus on those for which there is the greatest demand. These are also more likely to be facilities that are revenue generating and may be suitable for a public/private development and operation agreement. (p117)

From pg 57:

Bass Lake Park comprises 40 acres of undeveloped county park land located between the communities of Cameron Park and El Dorado Hills. A master plan was developed for the land in 2001 to 2003 that include potential amenities such as a community center, group picnic areas, basketball courts, a baseball field, toddler play area, playground, soccer field, dog park, disc golf, outdoor classroom, nature interpretive area, and parking. However, the environmental review process for this project was not completed and the project has been on hold since 2003. The master plan will need to be revisited before improvements for this site are implemented to reflect changes in community needs and recreation trends.

Frm pg 117:

More passive uses such as trails and nature areas may have greater value as the El Dorado Hills and Cameron Park communities are becoming more densely developed. These types of uses would also have fewer environmental impacts and cost less to develop and maintain. As a phased approach, the plan should scale back development of the active use facilities to focus on those for which there is the greatest demand. These are also more likely to be facilities that are revenue generating and may be suitable for a public/private development and operation agreement.



251016

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Curre nt zoning m ap

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Wed, Jul 23, 2014 at 5:13 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

To Shawna Purvines, Senior Planner

Re: Public Comment on LUPPU/ZOU Draft EIR
7/22/2014
El Dorado County TGPA/ZOU Draft EIR comments

The draft EIR addressing the changes being proposed to the General Plan and Zoning Ordinance cannot fully address the impact of the Zoning Ordinance changes because the full scope of the zoning change is not identified and/or not reasonably accessible. In my effort to find a mark-up version of our existing zoning map I have met with a county planner and they have agreed to begin the process of creating a mark-up version to facilitate a better understanding of the changes to the zoning map. Everyone agrees this will be valuable information; however it is too late to be of use for the dEIR.

It is my understanding that there are 8,000+ parcels directly affected. I also believe it's a safe assumption that as few as 24,000 parcels are indirectly affected. Many of these parcels are in central portions of the county and will affect surrounding uses and landowners. This is not addressed in the draft EIR. Zoning was unilaterally updated to meet the Land Use Requirements without considering updating Land Use to reflect current Zoning. The current Zoning map more accurately reflects existing conditions which is the appropriate baseline to determine impacts to be addressed in the EIR. Without clearly defining the existing conditions there is no way to analyze the potential impacts.

I attended the July 10th 2014, presentation on the Draft Environmental Impact Report for the Targeted General Plan Amendment and Zoning Ordinance Update and was impressed by the broad brush assumptions made within the analysis. This approach along with the lack of detail and access to changes within the zoning map creates the potential for lack of understanding of the scope of changes and potential for mistakes. In addition to the lack of understanding for the purpose of completing an accurate EIR, it also creates a transparency issue with the residents of this county that have been losing confidence in our local governments commitment to have an inclusive process.

Currently there is no other reasonable way to determine the existing vs proposed zoning.

NOP public comments addressed the same issue and the problem still exists. E.g.; comment 100053, 100069, 110007

I feel the county is buying into an EIR that doesn't even define the full scope of the project let alone address all potential impacts.

Recommendation; Create a mark-up Zoning Map that accurately reflects the changes. Quantify this parcel changes in a matrix and address impacts.

Thank you for your hard work,

Sincerely, Shelley Wiley

251016

Shawna L. Purvines

Principal Planner

County of El Dorado

Community Development Agency

Long Range Planning

2850 Fairlane Court

Placerville, CA 95667

Phone:(530) 621-5362/Fax: (530) 642-0508

shawna.purvines@edcgov.us

www.edcgov.us

251016

--

Shawna L. Purvines

Principal Planner

County of El Dorado

Community Development Agency

Long Range Planning

2850 Fairlane Court

Placerville, CA 95667

Phone:(530) 621-5362/Fax: (530) 642-0508

shawna.purvines@edcgov.us

www.edcgov.us

--

Shawna L. Purvines
Principal Planner

County of El Dorado
Community Development Agency
Long Range Planning
2850 Fairlane Court

251016

Placerville, CA 95667
Phone:(530) 621-5362/Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

251018

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 9:30 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **David Pava** <david@pava.com>
Date: Tue, Jul 22, 2014 at 9:22 AM
Subject: TGPA-ZOU DEIR
To: shawna.purvines@edcgov.us, "To:" <bosone@edcgov.us>, bostwo@edcgov.us, bosthree@edcgov.us, bosfour@edcgov.us, bosfive@edcgov.us, edc.cob@edcgov.us

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

--
David Pava
David@Pava.com

--

Shawna L. Purvines
Principal Planner

County of El Dorado
Community Development Agency
Long Range Planning
2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362/Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

251018

and are intended solely for the use of the individual or entity to whom they are addressed. Any retransmission, dissemination or other use of the information by persons other than the intended recipient or entity is prohibited.

If you receive this e-mail in error please contact the sender by return e-mail and delete the material from your system.

Thank you.

251019

EDC COB <edc.cob@edcgov.us>

Comment on TGPA-ZOU DEIR

1 message

Mike <mikemue2@comcast.net> Tue, Jul 22, 2014 at 10:45 AM
To: Ron Briggs <bosfour@edcgov.us>, Supervisor Ron Mikulaco <bosone@edcgov.us>, Brian Veerkamp <bosthree@edcgov.us>, Ray Nutting <bostwo@edcgov.us>, edc.cob@edcgov.us, Norma Santiago <bosfive@edcgov.us>

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I am requesting that you ensure that **the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.**

Thank you,

Mr & Mrs. Michael Mueller, RCDD
6696 Rhodes Ave.
El Dorado

EDC COB <edc.cob@edcgov.us>

TGPA-ZOU DEIR Comment

1 message

Jennifer Zraick <jgerm64@yahoo.com> Tue, Jul 22, 2014 at 6:33 AM
Reply-To: Jennifer Zraick <jgerm64@yahoo.com>
To: The BOSONE <bosone@edcgov.us>, "bostwo@edcgov.us" <bostwo@edcgov.us>, "bosthree@edcgov.us" <bosthree@edcgov.us>, The BOSFOUR <bosfour@edcgov.us>, "bosfive@edcgov.us" <bosfive@edcgov.us>, "edc.cob@edcgov.us" <edc.cob@edcgov.us>

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,

Jennie Zraick
Placerville, CA

251021

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 12:05 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **Ashley Blinn** <ashleyblinn@yahoo.com>
Date: Tue, Jul 22, 2014 at 12:03 PM
Subject: Comment on TGPA-ZOU DEIR
To: "shawna.purvines@edcgov.us" <shawna.purvines@edcgov.us>, "bosone@edcgov.us" <bosone@edcgov.us>, "bostwo@edcgov.us" <bostwo@edcgov.us>, "bosthree@edcgov.us" <bosthree@edcgov.us>, "bosfour@edcgov.us" <bosfour@edcgov.us>, "bosfive@edcgov.us" <bosfive@edcgov.us>, "edc.cob@edcgov.us" <edc.cob@edcgov.us>

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,
Ashley Blinn
3335 Sage Dr
Cameron Park, 95682

--

Shawna L. Purvines
Principal Planner

County of El Dorado

251021

Community Development Agency
Long Range Planning
2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362/Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

251022

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

RE: DS-ED CAC LUPPU letter

1 message

Larry Patterson <larry@pattersondev.com> Tue, Jul 22, 2014 at 1:05 PM
To: rsmart41@comcast.net, TGPA-ZOU@edcgov.us
Cc: "Johnson, Deanne" <deannej@att.net>, "McCoy, Kathy" <kathymccoy230@att.net>, "Peterson, Erik" <epeterson8101@comcast.net>, "Webb, Greg" <gregswestpalm@aol.com>, "Pierce, Dale" <dpierce@innercite.com>, "D-3, Brian" <bosthree@edcgov.us>, "Purvines, Shawna" <shawna.purvines@edcgov.us>

Short and to the point. I support it. Larry

From: rsmart41@comcast.net [mailto:rsmart41@comcast.net]
Sent: Tuesday, July 22, 2014 7:45 AM
To: TGPA-ZOU@edcgov.us
Cc: Johnson, Deanne; McCoy, Kathy; Patterson, Larry; Peterson, Erik; Smart, Robert; Webb, Greg; Pierce, Dale; D-3, Brian; Purvines, Shawna
Subject: DS-ED CAC LUPPU letter

DIAMOND SPRINGS AND EL DORADO

COMMUNITY ADVISORY COMMITTEE

Diamond Springs Fire Station
501 Main Street
Diamond Springs, CA 95916
July 22, 2014

To: El Dorado County Community Development Agency
2850 Fairlane Court
Placerville, CA 95667

Attn: Shawna Purvine:

Subject: **Targeted General Plan Amendment**

The Diamond Springs-El Dorado Community Advisory committee supports the El Dorado County Mixed-use Design Manual (released March 19, 2014), and hopes this is a pathway to developing enforceable standards for local communities. The CAC also notes that this manual is consistent with the historic overlays proposed for the townships of Diamond Springs and El Dorado.

Sincerely,

Robert A. Smart, Jr.
Chairperson

251023

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: ACTION ALERT! Please make a comment on the Draft EIR by 7/23/14 at 5:00pm

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 1:19 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

---------- Forwarded message ----------
From: **steve cogburn** <roostercogburn99@gmail.com>
Date: Tue, Jul 22, 2014 at 1:01 PM
Subject: Fwd: ACTION ALERT! Please make a comment on the Draft EIR by 7/23/14 at 5:00pm
To: Shawna Purvines <shawna.purvines@edcgov.us>, bosone@edcgov.us, bostwo@edcgov.us, bosthree@edcgov.us, bosfour@edcgov.us, bosfive@edcgov.us, edc.cob@edcgov.us

Subject: Comment on TGPA-ZOU DEIR

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

This is to important to be left unclear . We are directly impacted by all of this as we are directly across the street from the proposed San Stino sight..

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,
Mr./Mrs. Cogburn
4628 French Creek Rd.
Shingle Springs ca.95682

On Tue, Jul 22, 2014 at 11:17 AM, Lori at Shingle Springs Community Alliance <info@shinglespringscommunityalliance.com> wrote:

> Hi Steve,
>
> Sorry for the confusion. Bottom line is that the comment period is closing and that the DEIR is a poorly written document that does not provide clarity to the public. I was asking people to send in an email to state that because we may end up suing the county in the future, and it helps if people make comment that the DEIR is not clear.

I provided the sample email that can be copied and pasted to help get people started in making a comment.

Hahaha! I guess my email request wasn't any clearer than the DEIR!!! Kidding aside, I hope this is helpful.

Lori

> -------- Original Message --------
> Subject: Re: ACTION ALERT! Please make a comment on the Draft EIR by 7/23/14 at 5:00pm
> From: steve cogburn <roostercogburn99@gmail.com>
> Date: Tue, July 22, 2014 8:47 am
> To: Lori at Shingle Springs Community Alliance <info@shinglespringscommunityalliance.com>
>
> Lori this is a little confusing. I would sign if I couild figure out how?
>
> On Mon, Jul 21, 2014 at 8:15 PM, Lori at Shingle Springs Community Alliance <info@shinglespringscommunityalliance.com> wrote:
>
> Dear Shingle Springs residents and El Dorado County rural lifestyle supporters,
>
> The 120-day public comment period for the Draft Environmental Impact Report (DEIR) for the Targeted General Plan Amendments and Zoning Ordinance Update (TGPA/ZOU), [aka LUPPU (Land Use Policy Programmatic Update)], is closing on Wednesday, July 23rd at 5:00pm.
>
> The DEIR is the document that analyzes how the county will be affected by the proposed changes in the TGPA/ZOU. The comments are to be directed toward the analysis of those effects. It has become apparent to many of us that have attempted to read the DEIR that it is a huge (over 1,200 pages), vaguely-written document that does not clearly spell out to the general public how each of us will be impacted. Of the tens of thousands of parcels that will be impacted by the proposed changes, the DEIR does not clearly define where those parcels are in the county and whether or not those property owners or adjacent property owners have been notified of how they will be impacted.
>
> **Please use the sample email below to make comment on the Draft Environmental Impact Report by July 23, 2014, at 5:00pm.** Feel free to customize the sample email as you please.
>
> Click here to download the new Draft Environmental Impact Report (DEIR): http://www.edcgov.us/Government/LongRangePlanning/LandUse/SupportingDocuments/DraftEIRMarch2014/TGPA-ZOU_Public_DEIR_March_2014.aspx
> This is a large 105MB file and may take a while to download
>
> Click here to download the proposed Targeted General Plan Amendments (TGPA): http://www.edcgov.us/Government/LongRangePlanning/LandUse/SupportingDocuments/DraftEIRMarch2014/Proposed_TGPA_trackchanges.aspx
>
> Click here to download the proposed Zoning Ordinance Update (ZOU): http://www.edcgov.us/Government/LongRangePlanning/LandUse/SupportingDocuments/DraftEIRMarch2014/ZouMar2014Complete.aspx

There are a lot of other documents and links regarding the TGPA-ZOU on the Long Range Planning webpage: http://www.edcgov.us/Government/LongRangePlanning/LandUse/TGPA-ZOU_Main.aspx

Testimony from consultants at the July 10, 2014 Planning Commission hearing indicate that the analysis in the DEIR is "subjective" and "mushy." That is not the clear and concise analysis that the public needs to make good decisions. Click here to listen to the testimony: http://eldorado.granicus.com/MediaPlayer.php?view_id=2&clip_id=450 (start around 01:51:50 and 01:56:12).

The Board of Supervisors and county staff need to know that the general public is not being clearly informed by this DEIR.

****
****

Sample email:

To: <shawna.purvines@edcgov.us>,<bosone@edcgov.us>, <bostwo@edcgov.us>, <bosthree@edcgov.us>, <bosfour@edcgov.us>, <bosfive@edcgov.us>, <edc.cob@edcgov.us>
Subject: Comment on TGPA-ZOU DEIR

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,

[Your Name]
[Your town or address]

****
****

Thank you,

Lori Parlin, on behalf of the
Shingle Springs Community Alliance, No San Stino, and Stop Tilden Park
Keeping Shingle Springs Rural

251023

www.ShingleSpringsCommunityAlliance.com
www.StopTildenPark.com
www.NoSanStino.com
www.facebook.com/ShingleSpringsCommunityAlliance

--

Shawna L. Purvines
Principal Planner

County of El Dorado
Community Development Agency
Long Range Planning
2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362/Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

251023

251024

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 7:13 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **steve clark** <jsclark58@gmail.com>
Date: Tue, Jul 22, 2014 at 6:40 PM
Subject: Comment on TGPA-ZOU DEIR
To: shawna.purvines@edcgov.us, bosone@edcgov.us, bostwo@edcgov.us, bosthree@edcgov.us, bosfour@edcgov.us, bosfive@edcgov.us, edc.cob@edcgov.us

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,
Steve Clark

Shingle Springs Ca.

--

Shawna L. Purvines
Principal Planner

County of El Dorado
Community Development Agency
Long Range Planning

251024

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Phone:(530) 621-5362/Fax: (530) 642-0508
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www.edcgov.us

251025

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 7:36 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **Carole Browne** <carolebrowne@sbcglobal.net>
Date: Tue, Jul 22, 2014 at 7:22 PM
Subject: Comment on TGPA-ZOU DEIR
To: "shawna.purvines@edcgov.us" <shawna.purvines@edcgov.us>

Dear Ms. Purvines,

As property owners and residents in El Dorado County, we expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do we expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that we can make informed decisions about its impact to our quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped us understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

This zoning ordinance update is as unrealistic as President Obama's "Affordable Care Act," which appears to be neither affordable nor of the quality care promised most citizens. Your massively worded zoning document seems to have been drafted in a similar manner by bureaucrats with hidden agendas. We seriously ask that you reconsider this questionable piece of work and rewrite it so that even residents with a fifth grade reading intelligence can easily determine the scope of your rezoning proposal and its effect on the lives of El Dorado County citizens.

We are requesting that you ensure that the Final EIR will have clear and concise data and analysis so that we can understand how we will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,

Carole W. Browne
Jeffrey W. Browne

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251025

Shawna L. Purvines
Principal Planner

County of El Dorado
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2850 Fairlane Court
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shawna.purvines@edcgov.us
www.edcgov.us

251026

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Wed, Jul 23, 2014 at 8:00 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **Theresa** <wildrose903@verizon.net>
Date: Tue, Jul 22, 2014 at 10:54 PM
Subject: Comment on TGPA-ZOU DEIR
To: shawna.purvines@edcgov.us, bosone@edcgov.us, bostwo@edcgov.us, bosthree@edcgov.us, bosfour@edcgov.us, bosfive@edcgov.us, edc.cob@edcgov.us

Dear Ms. Purvines,

As property owners in El Dorado County, we expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do we expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that we can make informed decisions about its impact to our quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document will help us understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU. We are only now hearing about the proposed zoning ordinance update – aren't you required to notify all potentially affected property owners?
We are requesting that you ensure that the Final EIR will have clear and concise data and analysis so that we can understand how we will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,

Theresa and Dana Davis

1386 Muleshoe Pass, Placerville, CA 95667

--

Shawna L. Purvines
Principal Planner

County of El Dorado
Community Development Agency
Long Range Planning

251026

2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362/Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

251027

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Wed, Jul 23, 2014 at 12:29 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

---------- Forwarded message ----------
From: Mickey Sizemore <sizemore@hughes.net>
Date: Wed, Jul 23, 2014 at 9:53 AM
Subject: Comment on TGPA-ZOU DEIR
To: shawna.purvines@edcgov.us, bosone@edcgov.us, bostwo@edcgov.us, bosthree@edcgov.us, bosfour@edcgov.us, bosfive@edcgov.us, edc.cob@edcgov.us

Dear Ms. Purvines & Board of Supervisors,

As 35 year residents of El Dorado County, we expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do we expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that we can make informed decisions about its impact to our quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped us understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

We are requesting that you ensure that the Final EIR will have clear and concise data and analysis so that we can understand how we will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,

Michael Ann Sizemore

Jerry M. Sizemore

1700 St. Garth Way

Shingle Springs, CA 95682

--

Shawna L. Purvines

251027

Principal Planner

County of El Dorado
Community Development Agency
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2850 Fairlane Court
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Phone:(530) 621-5362/Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

251028

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Wed, Jul 23, 2014 at 12:34 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

---------- Forwarded message ----------
From: Ed Mattson <emattson95682@gmail.com>
Date: Wed, Jul 23, 2014 at 12:31 PM
Subject: Comment on TGPA-ZOU DEIR
To: shawna.purvines@edcgov.us
Cc: bosone@edcgov.us, Supervisor Ray Nutting <bostwo@edcgov.us>, bosthree@edcgov.us, Supervisor Briggs <bosfour@edcgov.us>, bosfive@edcgov.us

Dear Ms. Purvines,

As a member of the general public in El Dorado County, we expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) to be clear and concise. Not only do we expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that we can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document - filled with legal jargon - has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

We also reject the notion that putting all of the "moderate income" high density housing in the Shingle Springs Community Region will solve all of El Dorado County's affordable housing problems and create jobs, jobs, jobs! Why here? It has been proven that building homes, while it may create some temporary construction jobs does not create permanent good paying jobs! Putting in another fast food outlet or a big-box retailer does not create good-paying jobs. We already have a huge vacancy rate in the strip malls around town. We don't need any more. This problem of jobs is not unique to El Dorado County; it is universal since the recession of 2008!. Many of the large developers with their eyes on San Stino, and Marble Valley and all the rest are from outside the county and will bring in construction crews from outside the county. Their lobbyists have taken over our county government and corrupted this entire TGPA-ZOU process. If we need moderate income homes as you say why not develop parcels already available in the county? If the TIM fees are too high for this why not take all of the large development projects out of the CIP to lower them? Look around, we are county full of retirees with short-term life expectancies. Many of their homes, and surely some would qualify as moderate income, will be available soon. I urge you to start over.

If you must continue with the current process, we are requesting that you ensure that the Final EIR will have clear and concise data and analysis so that we can understand how we will be

directly and indirectly affected by the impacts of the TGPA-ZOU. And we demand an opportunity to comment on any changes! We the citizens of El Dorado County should have the final say, not the developers. 251028

Thank you,

Edward & Linda Mattson
4772 French Creek Road
Shingle Springs, CA 95682

--

Shawna L. Purvines
Principal Planner

County of El Dorado
Community Development Agency
Long Range Planning
2850 Fairlane Court
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Phone:(530) 621-5362/Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

251029

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

TGPA & DEIR comments

1 message

Lindell Price <lindellprice@gmail.com> Wed, Jul 23, 2014 at 2:35 PM
To: TGPA-ZOU@edcgov.us
Cc: Stanley Price <2StanleyPrice@gmail.com>

Comments on TGPA/ZOU & DEIR July 23, 2014

Proposed TGPA trackchanges

Page 12. Error on last line: El Dorado County has a "Division" of Transportation— not a "Department" of Transportation.
County ~~Department~~ **Division**

Page 13. While appropriate to note here and elsewhere that "staff has draft roadway standards which would be affected by changes …", roadway standards must comply with the General Plan. The General Plan must lead rather than follow current or draft roadway standards. The roadway standards must be comply with Targeted General Plan Amendment that is adopted.

Pages 19-20. **GOAL: SUPPORT THE ~~DEVELOMENT~~ DEVELOPMENT OF COMPLETE STREETS**

All decisions about our roads must incorporate the needs of all road users. Our entire road system should be analyzed in regard to the needs of various road users, with needed improvements prioritized and incorporated into our maintenance and capital improvement programs. Note that many techniques can be used to better accommodate a wider variety of road users. Self-enforcing roads and traffic calming can improve the utility and safety of our roads to serve pedestrians, children, bicyclists, older people and disabled people as well as bicyclists, where adding sidewalks or bike lanes to existing roads is not immediately practical.

Note that Complete Streets design is not limited to new higher-density developments, but may be needed to provide access to schools, bus stops, outdoor recreation, etc. in rural as well as higher-density areas.

TGPA-ZOU Public DEIR March 2014

Cover - This picture does not look like El Dorado County. Where was cover picture taken? What kind of trees are shown?

p. ES-3. • Policies TC-1a, TC-1b, and Table TC-1. *Note that the* Proposed TGPA trackchanges *states "***Consider the removal of Table TC-1 and move to another document (i.e. Standard Plans or Land Development Manual)***" The level of detail included in Table TC-1 does not belong in a General Plan. The Targeted General Plan Amendment considers* **the removal of Table TC-1***, rather than merely revising Table TC-1. The DEIR fails to appropriately address the Targeted General Plan amendment that includes removal of Table TC-1 as an option. Thus the Draft EIR fails to appropriately analyze the Targeted General Plan Amendment.*

p. 407 (5) 19. *Removal of Table TC-1 as suggested in the Targeted General Plan Amendment is not addressed. Table TC-1 contains a level of detail inappropriate for a General Plan. The DEIR fails to appropriately address the removal of Table TC-1, with the details of intersection spacing, road width, etc. moved to another document.*

251029

21. *Yes, table TC-2 should be deleted, and the references appropriately amended.*

26. *Public review of proposed changes to provide more flexibility of when sidewalk are required is important in order to comply with Complete Streets requirements.*

Lindell Price
3672 Millbrae Road
Cameron Park, CA 95682
(916) 804-7316

TGPA:ZOU:DEIR comments.pages.zip
159K

251030

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Comment on Consider Amending the Following Policies

1 message

Stanley Price <2stanleyprice@gmail.com> Wed, Jul 23, 2014 at 2:55 PM
To: TGPA-ZOU@edcgov.us
Cc: Lindell Price <lindellprice@gmail.com>

Regarding Consider Amending the Following Policies:

Number 19, The DEIR does not discuss the removal of Table TC-1. The Table TC-1 is too limiting to serve the diversity in El Dorado County. When new roadway standards are put in place, it will be easy to insure consistency of Policy.

Also, Number 19, in addition, add an additional benefit to "allowing for narrower streets and roadways" "for community health and safety benefits" "and to support..." This addition provides benefits to more of the residents and visitors of the County, to improve our lifestyle and well being.

--
Stanley Price
(530) 677-5052

251031

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Karen Mulvany Comments on EIR for TGPA and ZOU - 1

1 message

Karen Mulvany <kmulvany@gmail.com> Wed, Jul 23, 2014 at 3:02 PM
To: TGPA-ZOU@edcgov.us

Please see attached comment letter and exhibit 1, out of 6 exhibits total. Due to file size, the other exhibits will follow in separate emails.

Thank you,

Karen Mulvany

2 attachments

Comment letter Final.pdf
647K

Exhibit 1 2008 Lotus Coloma flood inundation map.pdf
4127K

PO Box 768
Lotus, CA 95651
July 21, 2014

El Dorado County Community Development Agency
Long Range Planning, Attn: Shawna Purvines
2850 Fairlane Court, Placerville, CA 95667

Submitted by email to: TGPA-ZOU@edcgov.us

To Whom It May Concern:

I am writing to submit comments with respect to the Draft Program EIR for el Dorado County Targeted General Plan Amendment (TGPA) and Zoning Ordinance Update (ZOU). In particular, my comments will focus on p. ES-4, which states:

- Policy 6.4.1.4 and 6.4.1.5. New Parcels in Flood Hazard Areas. Reference to the flood insurance rate maps would be removed from these policies to address recommendations by the Office of Emergency Services and Homeland Security regarding dam failure inundation.

My husband and I own two riverfront properties on the South Fork of the American; we live in one. We are especially concerned about this proposed revision, and submit five comments which follow below:

1. **First, the draft EIR errs in stating that the TGPA proposes to delete references to flood insurance rate maps, or FIRMs. In fact, the proposed deletions are to remove Dam Failure Inundation areas, not FIRMs.**

   The proposed changes to the General Plan are as follows (see p. 21 of Proposed TGPA track changes document):

   ## PUBLIC HEALTH, SAFETY, AND NOISE ELEMENT
   ### OBJECTIVE 6.4.1: [Flood Hazards] DEVELOPMENT REGULATIONS

   Policy 6.4.1.4 Creation of new parcels which lie entirely within the 100-year floodplain as identified on the most current version of the flood insurance rate maps provided by FEMA ~~or dam failure inundation areas as delineated in dam failure emergency response plans maintained by the County~~ shall be prohibited.

   Policy 6.4.1.5 New parcels which are partially within the 100-year floodplain ~~or dam failure inundation areas as delineated in dam failure emergency response plans maintained by the County~~ must have sufficient land available outside the FEMA ~~or County~~ designated 100-year floodplain ~~or the dam inundation areas~~ for construction of dwelling units, accessory structures, and septic systems. Discretionary applications shall be required to determine the

location of the designated 100-year floodplain ~~and identified dam failure inundation areas~~ on the subject property.

What is the difference between dam failure inundation areas and FIRMs? Dam Failure Inundation areas designate the land inundated by one or more dam failures upstream (more if an upstream dam failure would be expected to cause downstream dams to fail too). FIRMs, used for federal flood insurance purposes, designate a no-build area that is expected to be covered by floodwaters arising from natural rainfall and snowmelt reaching a level so high that the likelihood of occurrence is only 1% in any given year. FEMA publishes FIRMs. In contrast, Dam Failure Inundation maps are published by El Dorado County in order to comply with various state and federal laws.

In El Dorado County, particularly for the Slab Creek/Chili Bar Dam on the South Fork of the American, Dam Failure Inundation areas are far broader than the area covered by FIRMs, as dam failures are man-made catastrophic events of a large magnitude. As part of a community emergency planning team in 2008, my husband and I drafted a Dam Failure Inundation Area map overlaid on local streets and compared it to the FIRM map for the South Fork of the Amerian River, which is attached (see Exhibit 1). The area of inundation would cover highway 49 from Cold Springs Road to Greenwood Creek, with one short span high enough to escape the floodwaters. As can be clearly seen, the dam failure inundation area is dramatically larger than the FIRM area.

This is just one example of many dam failure inundation areas that lie within El Dorado County.

2. **Secondly, the proposed change does not merely delete references to Dam Failure Inundation Areas; it removes current general plan prohibitions against parcel splitting and additional development within Dam Failure Inundation Areas. The EIR does not address the environmental impact of this proposed change.**

The proposed changes to the General Plan are as follows (see p. 21 of Proposed TGPA track changes document):

PUBLIC HEALTH, SAFETY, AND NOISE ELEMENT
OBJECTIVE 6.4.1: [Flood Hazards] DEVELOPMENT REGULATIONS

Policy 6.4.1.4 Creation of new parcels which lie entirely within the 100-year floodplain as identified on the most current version of the flood insurance rate maps provided by FEMA ~~or dam failure inundation areas as delineated in dam failure emergency response plans maintained by the County~~ shall be prohibited.

Policy 6.4.1.5 New parcels which are partially within the 100-year floodplain ~~or dam failure inundation areas as delineated in dam failure emergency response plans maintained by the County~~ must have sufficient land available outside the FEMA ~~or County~~ designated 100-year floodplain ~~or the dam inundation areas~~ for construction of dwelling units, accessory structures, and septic systems. Discretionary applications shall be required to determine the

location of the designated 100-year floodplain ~~and identified dam failure inundation areas~~ on the subject property.

Thus, while today owners of parcels that lie entirely within dam failure inundation areas cannot split their parcels, the county is seeking to allow owners of parcels of land within dam failure inundation areas to split their parcels, allowing increased development and building construction along river corridors.

El Dorado County is home to multiple rivers, many of which include dams along their corridors. The County currently publishes multiple dam failure inundation maps, which are required by law, unless the State Office of Emergency Services has determined that it can ascertain the area of damage without a map. These Dam Failure Inundation maps can be found in Appendix A at:
http://www.edcgov.us/Government/Planning/Adopted_General_Plan.aspx

Dams lie along river corridors and feed into rivers; consequently dam failure inundation areas are comprised of river corridors that lie below dams. River corridors are riparian areas which are supposed to be protected, according to multiple county policies (see various General Plan Goals and Objectives below). Many of these riparian areas also lie within the County's Important Biological Corridor (IBC) overlays. The IBC overlay is included in the current land use map (Figure LU-1) also at:
http://www.edcgov.us/Government/Planning/Adopted_General_Plan.aspx

We request that the EIR assess the environmental impact of new development that would result from the TGPA's proposed lifting of today's parcel splitting prohibitions in dam failure inundation areas, also taking into account the following county objectives and goals from the current General Plan:

1. **OBJECTIVE 7.3.1: WATER RESOURCE PROTECTION**

   Preserve and protect the supply and quality of the County's water resources including the protection of critical watersheds, riparian zones, and aquifers.

2. **OBJECTIVE 7.3.3: WETLANDS**

   Protection of natural and man-made wetlands, vernal pools, wet meadows, and riparian areas from impacts related to development for their importance to wildlife habitat, water purification, scenic values, and unique and sensitive plant life.

3. **GOAL 7.4: WILDLIFE AND VEGETATION RESOURCES**

   Identify, conserve, and manage wildlife, wildlife habitat, fisheries, and vegetation resources of significant biological, ecological, and recreational value.

4. **OBJECTIVE 7.4.1: RARE, THREATENED, AND ENDANGERED SPECIES**

The County shall protect State and Federally recognized rare, threatened, or endangered species and their habitats consistent with Federal and State laws.

5. **OBJECTIVE 7.4.2: IDENTIFY AND PROTECT RESOURCES**

   Identification and protection, where feasible, of critical fish and wildlife habitat including deer winter, summer, and fawning ranges; deer migration routes; stream and river riparian habitat; lake shore habitat; fish spawning areas; wetlands; wildlife corridors; and diverse wildlife habitat.

6. **GOAL 7.6: OPEN SPACE CONSERVATION**

   Conserve open space land for the continuation of the County's rural character, commercial agriculture, forestry and other productive uses, the enjoyment of scenic beauty and recreation, the protection of natural resources, for protection from natural hazards, and for wildlife habitat.

7. **OBJECTIVE 7.6.1: IMPORTANCE OF OPEN SPACE**

   Consideration of open space as an important factor in the County's quality of life.

We are concerned that additional development in large riparian parcels that would be enabled by the proposed change in the TGPA would drastically alter the county's river corridors.

3. Environmental Hazards to People in Dam Failure Inundation Areas

It is human nature to discount the likelihood of severe events such as a dam failure to zero. But there is a growing body of evidence that we should be increasingly concerned with dam failure scenarios, not less concerned. The likelihood of such an event is not so small that we can dismiss the need to prepare for this kind of environmental disaster.

A. On January 24, 1997, a mudslide in the Mill Creek area along Highway 50 dammed the South Fork of the American at a location above both Slab Creek and Chili Bar Dams (see Exhibit 2 or http://landslides.usgs.gov/monitoring/hwy50/report.php). Due to a concern that this mudslide dam would break and then take out the dams below, some Lotus and Coloma residents were evacuated (see Exhibit 3 or http://www.coloma.com/flood/index.html). The mudslide itself was eventually dug out and removed – some 350,000 cubic yards of dirt on 35,000 truckloads. This additional fill, had it broken loose and been washed downstream, would have added more devastation to the flood inundation zone than is currently mapped. The slide at the Mill Creek site which created the last dam failure evacuation event is now continuously monitored by USGS because it moves regularly with sufficient rainfall. This slide could happen again.

B. The aging dam infrastructure is a growing environmental problem, not a diminishing one. Most dams in the US are over 50 years old, and the dam at Chili Bar, with storage capacity of 1339 acre feet, will be 50 years old this year. The Slab Creek Dam, with 16,600 acre feet of capacity, was built in 1967.

FEMA's 2013 "Living with Dams" publication (see Exhibit 4 or http://www.fema.gov/media-library-data/20130726-1845-25045-7939/fema_p_956_living_with_dams.pdf) cites common beliefs vs. facts about dams:

> **FICTION** ***"That dam has been here for years—it's not going anywhere."***
>
> **FACT Advancing age can make dams more susceptible to failure.**
>
> The average age of dams in the United States is more than 53 years.
>
> As dams get older, deterioration increases and repair costs rise. Some common problems of older dams are:
>
> - Deteriorating metal pipes and structural components; metal rusts over time, and after 50 years it can fail completely.
> - Sediment-filled reservoirs. Some sediment may have contaminants from chemicals in runoff from upstream.
> - Runoff from subdivisions and businesses built upstream. Roofs and concrete streets and sidewalks increase the volume of runoff to the reservoir.

(Excerpt from 3rd page of FEMA publication)

C. Furthermore, in 2011, the USGS published the ARkStorm Scenario (see Exhibit 5 or http://pubs.usgs.gov/of/2010/1312/of2010-1312_text.pdf), which surveys the science and historical record of megafloods in California, which have occurred every 150-200 years, turning central California into an inland sea, most recently in 1861-1862. While only a small portion of El Dorado County would be inundated by this inland sea, the high levels of runoff generated by an ARkStorm are likely to overwhelm El Dorado County's dams. USGS believes the probability of an ARkStorm, which is higher than the likelihood of "the big one" earthquake, demands planning.

Thus, dam failures are not scenarios that we can afford to wishfully ignore. Indeed, state law establishes requirements before dam failure inundation maps can be removed from the public domain:

Legal Requirements Regarding Dam Failure Inundation Areas

The legal provisions to escape the *creation* of dam failure inundation maps by dam owners is at http://www.calema.ca.gov/hazardmitigation/pages/dam-inundation-program.aspx

> **§2578. Waiver from Inundation Map Requirement**
> Up to 90 days after notice pursuant to section 2576, a dam owner may apply for a waiver from producing an inundation map where:

(a) The effects of potential inundation in terms of death or personal injury can be ascertained without an inundation map; and,
(b) Adequate evacuation procedures can be developed without benefit of an inundation map.
Authority cited: Sections 8567 and 8586, Government Code.
Reference: Section 8589.5, Government Code.

The provisions that enable a county to escape responsibility for *publishing* a dam failure inundation map are cited also at:
http://www.calema.ca.gov/hazardmitigation/pages/dam-inundation-program.aspx

per § 8589.5 of the Government Code:
(d) Where both of the following conditions exist, the Office of Emergency Services may waive the requirement for an inundation map:
(1) Where the effects of potential inundation in terms of death or personal injury, as determined through onsite inspection by the Office of Emergency Services in consultation with the affected local jurisdictions, can be ascertained without an inundation map.
(2) Where adequate evacuation procedures can be developed without benefit of an inundation map.

As noted above, in 2008 my husband and I made a map of the Lotus-Coloma area depicting the dam failure inundation area and the FIRM area (or 1% flood risk area). Every local resident who has seen our 2008 map comparing the two has been astounded at the magnitude of dam failure inundation. Not one single person that I have spoken to in the Lotus Coloma area would have known how far they should travel to escape a dam failure inundation area. Thus we are concerned that Section 8589.5(2) requirements have not been met.

The local Office of Emergency Services (OES) has developed a phone notification system to alert river corridor residents of flooding. In the New Years's Eve flood of 2005/2006, this system was employed to warn local residents of rising waters, but it malfunctioned, as calls were placed but the recording failed; there was no message delivered. At the time, we were living elsewhere and we received this call, but my husband's elderly parents who were then living on our riverfront property, did not.

Locally, many if not most residents must use a PO Box to receive US mail (as USPS does not deliver to many local physical addresses) and it is this PO Box that appears on California driver's licenses, making it difficult for law enforcement to identify riverfront residents who are renting. In 2012, according to a National Health Interview Survey (see exhibit 6 or http://gigaom2.files.wordpress.com/2012/12/wireless201212.pdf), 36% of households no longer had a land line, and 58% of renters rely solely on wireless phones, making identification of renting residents in a hazard area even more challenging.

Dam Failures are sudden catastrophic events. In such scenarios there is little time to correct bugs in the emergency system without risking profound loss of life. The emergency system must be robust, redundant and thoroughly tested prior to any contemplation of removing vital safety information from the public domain.

4. Laws Regarding Disclosure of Environmental Hazards

California State law requires that property owners and their real estate agents disclose environmental hazards, including a property's location within a dam failure inundation area, prior to completing a sale. Removing dam failure inundation maps from a county's website does not eliminate known information. It does however, place property owners and real estate agents at risk of litigation nightmares, whereby each would have to prove that they did not know that property was located in a dam failure inundation area:

> California Civil Code Section 1103. (a) Except as provided in Section 1103.1, this article applies to the transfer by sale, exchange, installment land sale contract, as defined in Section 2985, lease with an option to purchase, any other option to purchase, or ground lease coupled with improvements, of any real property described in subdivision (c), or residential stock cooperative, improved with or consisting of not less than one nor more than four dwelling units.
> (b) Except as provided in Section 1103.1, this article shall apply to a resale transaction entered into on or after January 1, 2000, for a manufactured home, as defined in Section 18007 of the Health and Safety Code, that is classified as personal property intended for use as a residence, or a mobilehome, as defined in Section 18008 of the Health and Safety Code, that is classified as personal property intended for use as a residence, if the real property on which the manufactured home or mobilehome is located is real property described in subdivision (c).
> (c) This article shall apply to the transactions described in subdivisions (a) and (b) only if the transferor or his or her agent is required by one or more of the following to disclose the property' s location within a hazard zone:
>
> (1) A person who is acting as an agent for a transferor of real property that is located within a special flood hazard area (any type Zone "A" or "V") designated by the Federal Emergency Management
> Agency, or the transferor if he or she is acting without an agent, shall disclose to any prospective transferee the fact that the property is located within a special flood hazard area if either:
>
> (A) The transferor, or the transferor's agent, has actual knowledge that the property is within a special flood hazard area.
> (B) The local jurisdiction has compiled a list, by parcel, of properties that are within the special flood hazard area and a notice has been posted at the offices of the county recorder, county assessor, and county planning agency that identifies the location of the parcel list.
>
> (2) A person who is acting as an agent for a transferor of real property that is located within an area of potential flooding designated pursuant to

> Section 8589.5 of the Government Code[1], or the transferor if he or she is acting without an agent, shall disclose to any prospective transferee the fact that the property is located within an area of potential flooding if either:
>
> (A) The transferor, or the transferor's agent, has actual knowledge that the property is within an inundation area.
>
> (B) The local jurisdiction has compiled a list, by parcel, of properties that are within the inundation area and a notice has been posted at the offices of the county recorder, county assessor, and county planning agency that identifies the location of the parcel list.

Given current state disclosure requirements, this is another reason for the county to retain dam failure inundation maps.

5. Laws Regarding County Liability for New Development in Flood Areas

New legislation in the 2006 session for the first time in history placed a measure of liability upon local counties and cities for flood damage incurred in new development authorized in areas susceptible to flooding.

> California Water Code 8307. (a) A city or county may be required to contribute its fair and reasonable share of the property damage caused by a flood to the extent that the city or county has increased the state's exposure to liability for property damage by unreasonably approving new development in a previously undeveloped area that is protected by a state flood control project. However, a city or county shall not be required to contribute if, after the amendments required by Sections 65302.9 and 65860.1 of the Government Code have become effective, the city or county complies with Sections 65865.5, 65962, and 66474.5 of the Government Code as applicable with respect to that development.
>
> This section shall not be construed to extend or toll the statute of limitations for challenging the approval of any new development.
>
> (b) A city or county is not required to contribute unless an action has been filed against the state asserting liability for property damage caused by a flood and the provisions of subdivision (a) providing for contribution have been satisfied. A city or county is not required to contribute if the state settles the claims against it without providing the city or county with an opportunity to participate in settlement negotiations.
>
> (c) For the purposes of this section:
>
> (1) "State flood control project" means any flood control works within the Sacramento River Flood Control Project described in Section 8350, and of **flood control projects in the Sacramento River and San Joaquin River watersheds** authorized pursuant to Article 2 (commencing with Section 12648) of Chapter 2 of Part 6 of Division 6.

[1] This is the Dam Failure Inundation Area.

(2) "Undeveloped area" means an area devoted to "agricultural use," as defined in Section 51201 of the Government Code, or "open space land," as defined in Section 65560 of the Government Code, that, as of January 1, 2008, is not already designated for development in a general or specific plan or by a local zoning ordinance.

(3) "Unreasonably approving" means approving a new development project without appropriately considering significant risks of flooding made known to the approving agency as of the time of approval and without taking reasonable and feasible action to
mitigate the potential property damage to the new development resulting from a flood.

(4) "Feasible" means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.

(d) This section shall not apply to any land or projects for which an application for development has been submitted to the city or county prior to January 1, 2008.

At least some of the dams in El Dorado County have a flood control purpose (often in addition to other purposes such as power generation). El Dorado County's dams on the western slope of the Sierras are part of the Sacramento River watershed. We request that the EIR assess the county's environmental and development responsibilities in light of this legislation.

Thank you for considering these comments.

Respectfully,

Karen Mulvany

- Exhibit 1: Dam Failure Inundation Area and 1% FEMA Flood Line for Lotus Coloma Valley, 2008
- Exhibit 2: USGS 1997 Landslide at Mill Creek
- Exhibit 3: Coloma.com 1997 Flood webpage
- Exhibit 4: FEMA's Living With Dams publication, 2013
- Exhibit 5: USGS' ARkStorm Scenario, 2011
- Exhibit 6: Wireless & Wireline Households, National Health Interview Survey, 2012

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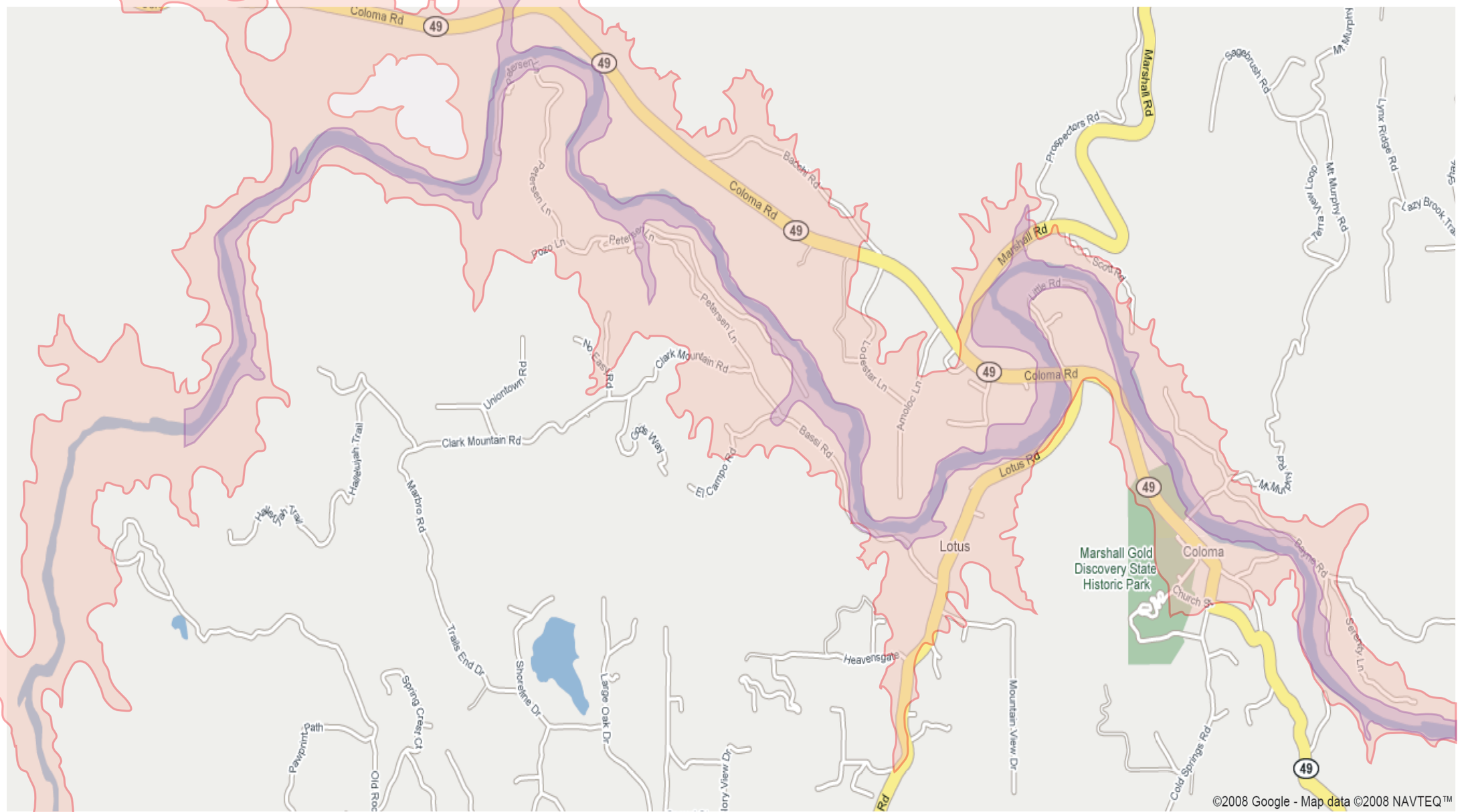
251031

Lotus/Coloma Flood Emergency Planning

PG&E Dam Failure Inundation Zone*
FEMA Flood Zone*

* All flood zone lines are estimates and subject to significant error.



251032

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Karen Mulvany Comments on EIR for TGPA and ZOU - 2

1 message

Karen Mulvany <kmulvany@gmail.com> Wed, Jul 23, 2014 at 3:04 PM
To: TGPA-ZOU@edcgov.us

Please find Exhibits 2 and 3 which are part of my comment letter with 6 exhibits.

Thank you,

Karen Mulvany

2 attachments

Exhibit 2 USGS Landslide at Mill Creek 1997.pdf
1951K

Exhibit 3 Coloma-Lotus_ Jan 1997 Flood.pdf
1396K

Landslide Hazards Program

Report

Mark E. Reid, and Richard G. LaHusen, 1998, Real-time Monitoring of Active Landslides Along Highway 50, El Dorado County: adapted from: California Geology, v.51, n.3, p.17-20

Late in the rainy evening of January 24, 1997, tons of earth gave way down a steep Sierra Nevada canyon slope and slid onto a major northern California highway (Photo 1). The since-named Mill Creek landslide closed U.S. Highway 50 and briefly dammed (5 hours) the nearby South Fork of the American River, about 25 miles east of Placerville (Map) (Sydnor, 1997). The slide damaged or destroyed three cabins (Photo 2), and waters dammed by the landslide flooded two vehicles on the highway. Fortunately, there were no fatalities and the waters subsided after the river cut through the dam later that night. However, before Highway 50 could be reopened, an estimated 350,000 cubic yards of slide material (35,000 truck loads) had to be removed over a 4-week period, at a cost of $4.5 million (California Department of Transportation, 1997). Indirect economic costs due to highway closure were estimated at more than $1 million per day.

Photo 1: Aerial view of the Mill Creek landslide blocking Highway 50. Caltrans Photo courtesy of Lynn Harrison, Caltrans

Map: Location Map, Highway 50 Landslide area, California (click to enlarge)

Following the Mill Creek landslide, the U.S. Geological Survey (USGS), in cooperation with the Eldorado National Forest, acted quickly to install monitoring equipment that would measure landslide conditions and provide the results in real-time. The system was installed on the nearby active Cleveland Corral landslide which has the potential of blocking Highway 50 and possibly damming the American River if the entire slide moved rapidly. This landslide, with its downslope edge about 150 feet above the highway, had moved during the wet winter of 1996 and continued to move slowly downslope during the winter of 1997 (Photo 3).

Many other large landslides along this corridor of the South Fork of the American River have moved in the geologic past, and some may impact Highway 50 in the future (Wagner and Spittler, 1997). Although most slides in this canyon are dormant during dry times, they typically become active during or following extended periods of rain or snow melt due to increased ground-water pressures. These elevated pressures, in turn, reduce the overall strength of the slide and induce downslope movement. Many landslides along the corridor move slowly, traveling perhaps only a few inches over many days. Occasionally, however, a landslide will move rapidly, traveling hundreds of feet in a matter of minutes, as did the Mill Creek landslide in January 1997. Another occurrence upriver in 1983 closed the highway for 75 days (Kuehn and Bedrossian, 1987).

Photo 2: Cabins damaged and destroyed by the massive Mill Creek landslide that occurred on January 24, 1997. USGS Photo by Mark Reid, USGS/Menlo Park, 1997

Photo 3: Lateral scarp formed by recent movement at the edge of the monitored Cleveland Corral landslide. Sliding ground is to the right of the bare soil exposed in the scarp. Highway 50 is visible (gray, upper center) below the slide. USGS Photo by Mark Reid, USGS/Menlo Park

Prior to the installation of monitors, landslide movement patterns and associated hydrologic conditions along Highway 50 were not systematically measured. During the wet sinter of 1996, U.S. Forest Service geologists observed ground cracking in the hillslope that would later become the Mill Creek landslide. These field observations, however, were not sufficient to indicate that sudden and rapid movement would occur the following year. Elsewhere in the world, studies of landslides have shown that rapid slope failure may be preceded by gradually accelerating movement (Terzaghi, 1950; Varnes, 1983; Voight, 1989; Fukuzono, 1990). In order to detect these kinds of possible precursor movement for active landslides along Highway 50, continuous real-time monitoring was needed.

Soon after the Mill Creek landslide, the USGS installed a real-time monitoring system at the nearby active Cleveland Corral Landslide. A real-time monitoring system provides near-continuous measurements on the hydrologic conditions and ground movement of the landslide. This system is borrowed from USGS data acquisition and telemetry systems developed for remote monitoring of active volcanoes. Sensors for the system are installed in or on the landslide and the data are transmitted via radio telemetry to USGS computers (Photo 4). Data collected at such a continuous rate and in real-time will greatly increase the understanding of dynamic landslide activity and behavior in the Highway 50 corridor. The data will enable geologists to detect changes in landslide movement, monitor the rainfall

and ground-water conditions, and hopefully anticipate possible catastrophic movement at the Cleveland Corral landslide.

Photo 4: Testing the solar-powered radio telemetry system used for real-time monitoring. USGS Photo by Mark Reid, USGS/Menlo Park

Photo 5: Measuring landslide movement using a surface extensometer. Extensometer crosses several scarps (breaks that expose the reddish soils) at the head of the landslide. USGS Photo by Richard LaHusen, USGS/CVO

Landslide movement and hydrologic conditions are being monitored using a variety of sensors. The amount of downslope movement is recorded by extensometers, anchored to the ground surface at the edge of the landslide (Photo 5). Ground vibrations associated with slide movement are monitored by geophones buried within the landslide. (These geophones measure a wider dynamic response than standard earthquake seismometers, and have successfully detected large debris flows from volcanoes [Hadley and LaHusen, 1995; LaHusen, 1996]). Ground-water conditions within the slide are monitored by pore-water pressure sensors, and on-site rain gages record rainfall. Data are sampled from these sensors every second and transmitted to the USGS every 10 minutes. However, data are transmitted immediately in the event of strong ground vibrations associated with massive landslide movement.

The USGS also has a cooperative project with the California Department of Transportation (Caltrans) to monitor five active landslide sites (including the Mill Creek landslide) along the Highway 50 corridor. Real-time data from the overall monitoring system, which involves 11 stations and 58 surface and subsurface instruments (Photo 6), are relayed through USGS computers to Caltrans engineers and geologists. These data may provide Caltrans with early notification of landslide activity and may also aid Caltrans engineers in the design of remedial measures to slow or halt these active landslides.

Photo 6: Caltrans drill rig installing subsurface extensometers (to measure landslide movement) and pore-water pressure sensors (to measure ground-water conditions) in the Mill Creek landslide. USGS Photo by Mark Reid, USGS/Menlo Park

Acknowledgments

We thank Steve Ellen and Richard Iverson (USGS), and Roy Bibbens (Caltrans) for their helpful reviews of this manuscript.

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January 1997 Flood

South Fork of the American River, Coloma-Lotus, California

How big was the flood?

Photo 1/2/97 by Barbara Thomas. See bottom of page for more information.

Flood Relief Information Center

Mother Lode Church - (916) 622-0686
870 Beach Court, Coloma
(Off Hwy 49, between Yosum's and Ceccardi's)
If busy, leave message at (916) 642-9720
If you have no phone, leave your address and we will visit the site.

Flood relief needs:
Work crews
Volunteer coordinators
Donations of goods, services, money
Location of salvaged goods

Flood assistance available:
Information or counseling
Work crews
Clothing, other goods
Lost and found service

Donations
If you want to donate, please

Flood Relief Meeting

send checks to The American Red Cross and designate Coloma-Lotus area.

Tuesday, January 14, 7:00 p.m. Mother Lode Church

1/31/97: There's lot's more cleanup to do, and opportunities for everyone to help. See the flood volunteers page for more information.

1/25/97: The Coloma Valley was evacuated last night when a **landslide** near Kyburz blocked the upper South Fork of the American River. One home was destroyed in the slide, and Highway 50 is closed again from Pollock Pines to Meyers.

Water began backing up behind the temporary dam, and officials feared that when it broke through there could be a wall of water that could destroy Slab Creek Reservoir and cause massive damage downstream. Fortunately the water worked its way through more politely and residents were allowed to return to their homes this morning.

For more details, see articles posted by the Sacramento Bee (detailed text). See the Coloma Weather Page for links to current weather and highway conditions.

1/23/97: **The numbers are in.** They have been able to take readings from the Chili Bar spillway, to determine the peak flows on January 2, 1997. They have determined the peak volume at Chili Bar to be 71,000 cubic feet per second (cfs). With all the runoff and side creeks, downstream volumes would be higher.

We've been told that the 100-year flood level at Chili Bar is estimated at 70,000 cfs, so this was in fact a 100-year flood. Note that for the upper South Fork (Kyburz area) it was more of a 200-300-year flood.

1/20/97: **THANK YOU** to all the **volunteers** who helped with cleanup the past two weekends! If you're feeling left out of the action, you can relax -- there's more to be done, and work parties will continue at least through the next two weekends.

A special **THANKS** goes to **John Tillman**, local resident and owner of Sierra Disposal. John donated two large dumpsters for river clean-up projects.

For more information on how you can be a part of the recovery effort, check the volunteers page or contact the Mother Lode Church at (916) 622-0686.

If you find **salvage** along the river, please remember that someone may be looking for it -- "finders keepers" doesn't apply when someone's belongings have been washed downstream. You can turn useable salvage in to Mother Lode Church or just give them a call with of the description of what you found, and they will try to match the lost with the found. Likewise if you've lost something,

contact the church.

Do you have **high-water photos** of the "blue house" on river left just above the Hwy 49 bridge? The owners need photos for insurance. If you have photos of this house or others inundated, please contact us and we'll try to connect you with the homeowners.

Current South Fork River Conditions

Great Flood Resource!
Floods of 1997, Northern California Information Resources

Bruce Lewis' 1/10/97 email to Gold Country Paddlers

Rich Shipley's 1/7/97 email to Gold Country Paddlers

Boaters' Report 1/6/97 from The River Store

Would Auburn Dam Have Helped?

Although the Auburn Dam would not have prevented any of the flooding and devastation that occurred this past week, lawmakers may try to use these incidents to revive that project. Friends of the River calls for a review of the existing flood protection system and asks you to get involved.

Photographs

Chili Bar Dam, the Nugget, and the Chili Bar put-in

Troublemaker Rapid and Highway 49 area

Henningsen-Lotus Park and Camp Lotus

Flood photos by Jeff Lohse

Other 1997 Flood-Related Sites

The Mountain Democrat

The Sacramento Bee

KOVR Channel 13 Storm Watch

The panoramic photo of Coloma and Marshall Park at the top of the page was taken from Mt. Murphy Road on 1/2/97, by Barbara Thomas. In the center of the picture you can see the one-lane bridge that connects Hwy 49 with Mt. Murphy and Bassi Roads. To the right of the bridge, the rear 1/3 of the Grange is inundated. Highway 49 in the park was closed for most of that day. (Click on the photo to see an enlargement.)

South Fork of the American River

The River Store

Coloma Valley Home Page

Last update 7/8/98

251033

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Karen Mulvany Comments on EIR for TGPA and ZOU - 3

1 message

Karen Mulvany <kmulvany@gmail.com> Wed, Jul 23, 2014 at 3:05 PM
To: TGPA-ZOU@edcgov.us

Please find Exhibit 4 out of 6 Exhibits that go with my comment letter on the EIR.

Thank you,

Karen Mulvany

Exhibit 4 2013 FEMA Living With Dams.pdf
13564K

Living With Dams

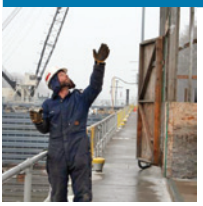
Know Your Risks

FEMA P-956 / February 2013

FEMA

Common Beliefs About Dams

FICTION *"The Army Corps of Engineers is responsible for most dams in the U.S."*



FACT State dam safety programs have oversight of most dams in the United States.

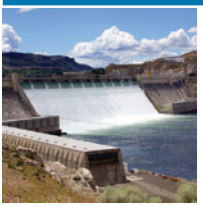
State agencies regulate more than 80% of the Nation's dams.

FICTION *"Dams are like roads and bridges. The government takes care of them."*

FACT Most dams are privately owned. Dam owners are responsible for maintenance and upgrades.

Private dam owners are responsible for more than 65% of the Nation's dams. Many lack the financial resources necessary for adequate dam maintenance.

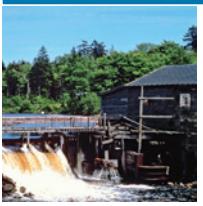
FICTION *"There are only a few dams in my State."*



FACT There are more than 84,000 dams in the United States (as of 2010). Most States are home to hundreds—or thousands—of dams, and each must meet regulatory criteria.

- Texas has the most dams—more than 7,000—followed by Kansas (6,087), Missouri (5,099), Oklahoma (4,755), and Georgia (4,606).
- Mississippi, North Carolina, and Iowa each have more than 3,000 dams.
- Five States—Alabama, Montana, Nebraska, South Carolina, and South Dakota—each have more than 2,000 dams.
- Fifteen other States have more than 1,000 dams each.
- Delaware has the fewest number of dams, with 86.

FICTION *"That dam has been here for years—it's not going anywhere."*

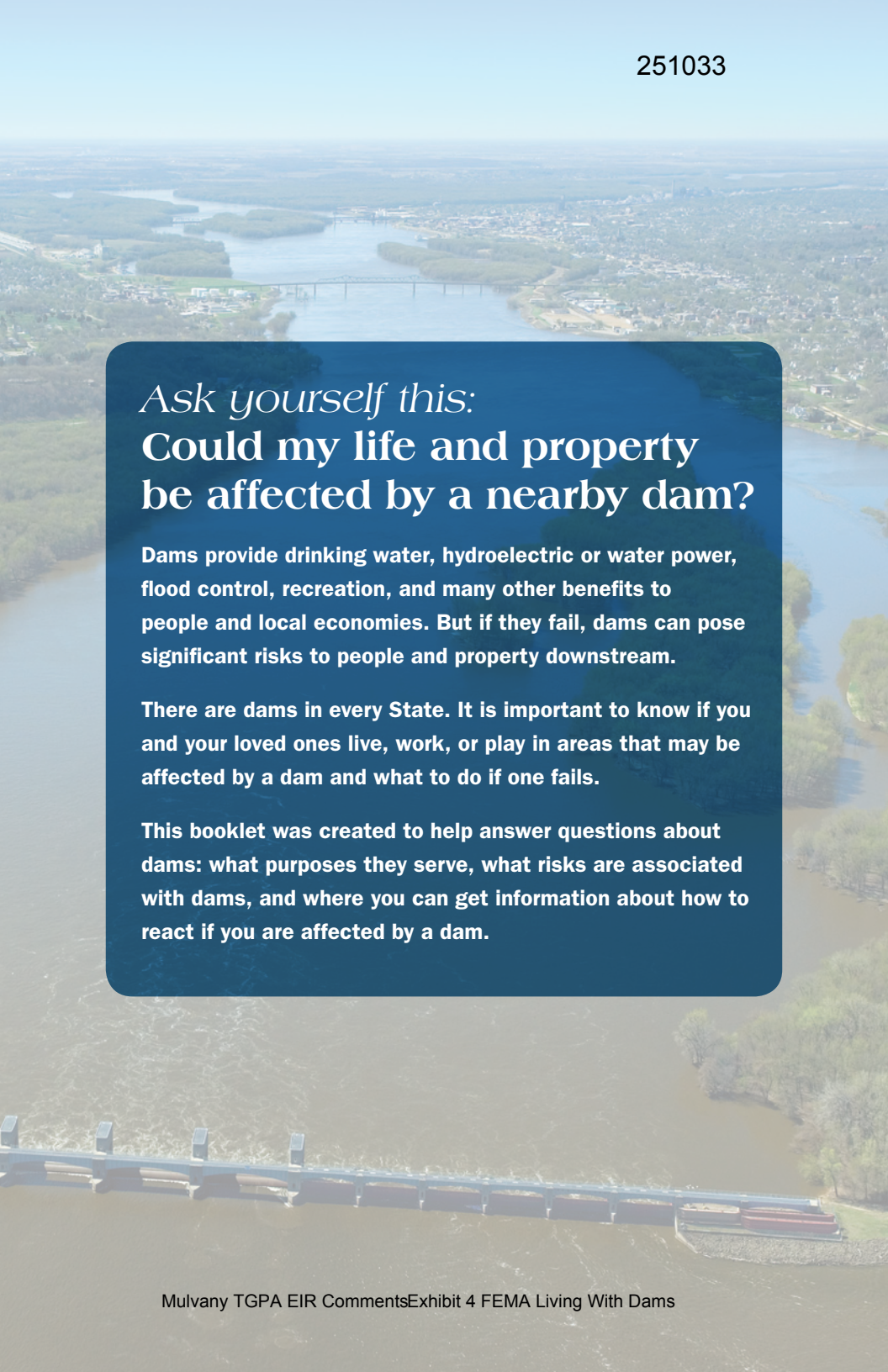


FACT Advancing age can make dams more susceptible to failure.

The average age of dams in the United States is more than 53 years.

As dams get older, deterioration increases and repair costs rise. Some common problems of older dams are:

- Deteriorating metal pipes and structural components; metal rusts over time, and after 50 years it can fail completely.
- Sediment-filled reservoirs. Some sediment may have contaminants from chemicals in runoff from upstream.
- Runoff from subdivisions and businesses built upstream. Roofs and concrete streets and sidewalks increase the volume of runoff to the reservoir.



Ask yourself this:

Could my life and property be affected by a nearby dam?

Dams provide drinking water, hydroelectric or water power, flood control, recreation, and many other benefits to people and local economies. But if they fail, dams can pose significant risks to people and property downstream.

There are dams in every State. It is important to know if you and your loved ones live, work, or play in areas that may be affected by a dam and what to do if one fails.

This booklet was created to help answer questions about dams: what purposes they serve, what risks are associated with dams, and where you can get information about how to react if you are affected by a dam.

Why should I care about dams?

Although dam failures are infrequent, the impacts can be catastrophic, often far exceeding typical stream or river flood events.

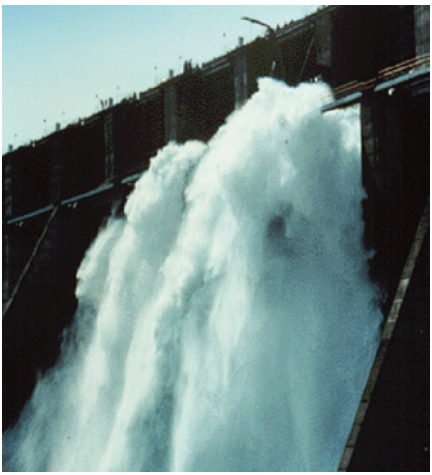
What Dams Provide

Dams are assets, but they can also be hidden liabilities.

Dams provide vital benefits, including flood protection, water supply, hydropower, irrigation, and recreation. Imagine the impact of losing a major reservoir or flood control dam.

- Would there be catastrophic flooding? How many homes and businesses might be flooded? How many people would be displaced?
- Would there be adequate water for domestic use? Irrigating crops? Caring for livestock? Fighting fires?
- Are local utilities dependent on hydropower? How many lives and jobs would be affected by temporary shutdown or closure of an industry dependent on hydropower?
- How would transportation systems—roads, railroads, navigable waterways—be affected?
- How would local economies, jobs, and areas dependent on recreation be affected if a reservoir is lost?

If they are not maintained and operated correctly, dams can pose risks to those living downstream. When dams age, deteriorate, or malfunction, they can release sudden, dangerous flood flows. Dam failures can pose safety risks to an often unaware public.



Many communities in the United States are in the vicinity of at least one dam. In many cases, large populations, vital elements of our infrastructure, jobs, and businesses are located downstream of dams.

Dam failure floods are almost always more sudden and violent than normal stream, river, or coastal floods. They often produce damage that looks like tornado damage.

Dams are owned and operated by many different types of owners. Sometimes they serve a limited

purpose—for instance, a neighborhood association that wants its homes built around a lake—and sometimes they serve larger interests—for instance, a water supply utility.

Downstream development increases the potential consequences of a dam's failure. Dams built in once rural areas that would have affected nothing but open fields if they failed, are now capable of affecting neighborhoods and industrial areas. As a result of both new dam construction and development downstream of existing dams, the number of dams that could pose a risk to human life if they fail is steadily increasing. In the last decade, that number has increased by over 1,000 to a total of about 14,000 dams.

- **Any dam has the potential to adversely affect downstream areas and lives; and**
- **Many dams, should they fail, can also affect the delivery of essential utilities or flood control.**

Facts About Dams

Purposes

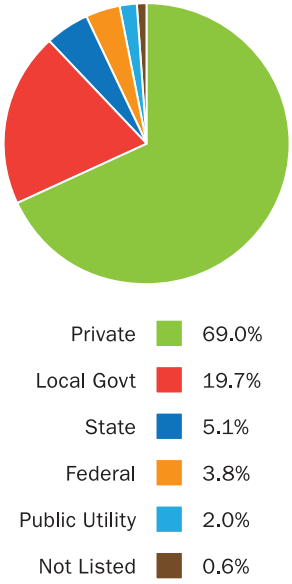
The purpose of a dam is to retain or store water or other liquid-borne materials for any of several reasons, such as human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, and pollution or flood control. Many dams fulfill a combination of these functions.

Ownership

Dams are unique components of our infrastructure because most dams are privately owned.

Dam owners are solely responsible for keeping their dams safe. Owners must finance maintenance, repairs, and upgrades, which can be expensive. Costs for non-Federal dam rehabilitation projects commonly range from hundreds of thousands to millions of dollars per dam. Such high price tags place a huge burden on dam owners, many of whom cannot afford to maintain their dams.

U.S. Dam Owners



Regulation

Dams are regulated for safety by the government in much the same way as bridges, factories, etc. States regulate the majority of dams in the United States (about 80 percent); the Federal government regulates the remaining 20 percent.

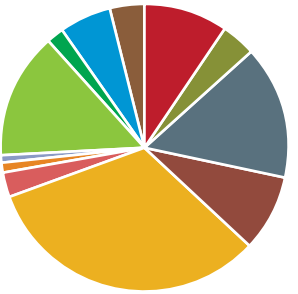
Main Types of Dams

Manmade dams may be classified by the type of construction material used, the methods used in construction, the slope or cross-section of the dam, the way the dam resists the forces of the water pressure behind it, the means used for controlling seepage, storage characteristics (on a watercourse, off-stream, above or below ground level), and occasionally, according to the purpose of the dam.

Dams can be constructed from a variety of materials, including soil, rock, tailings from mining or milling, concrete, masonry, steel, timber, miscellaneous materials (such as plastic or rubber), and combinations of these materials.

Embankment dams are the most common type of dam in use today. Materials used for embankment dams include natural soil or rock or waste materials obtained from mining or milling operations. An embankment dam is termed an "earthfill" or "rockfill" dam, depending on whether it comprises compacted earth or mostly compacted or dumped rock. The strength of an embankment dam is primarily a result of the type of materials from which the dam is made.

Dams by Primary Purpose



Recreation	34%
Flood Control	16%
Fire Protection, Stock, or Small Fish	15%
Irrigation	9%
Water Supply	8%
Other	6%
Unknown	4%
Hydroelectric	3%
Fish and Wildlife Pond	2%
Tailings	1%
Debris Control	>1%
Navigation	>1%

Embankment dam

Concrete dams may be categorized as gravity and arch dams depending on how they resist water pressure from the reservoir. The most common type of concrete dam is a concrete gravity dam. The mass weight of concrete and friction resist the reservoir water pressure. A buttress dam is a specific type of gravity dam in which the large mass of concrete is reduced, and the water pressure forces are diverted to the dam foundation through vertical or sloping buttresses. Gravity dams are constructed of vertical blocks of concrete with flexible seals in the joints between the blocks.

Concrete dam

Concrete arch dams are typically thinner in cross-section than gravity dams. The reservoir water forces acting on an arch dam are carried laterally into the abutments. The shape of the arch may resemble a segment of a circle or an ellipse, and the arch may be curved in the vertical plane as well as the horizontal plane. Such dams are usually constructed of a series of vertical blocks that are keyed together; barriers to stop water from flowing are provided between the blocks. Variations of arch dams include multi-arch dams, in which more than one curved section is used, and arch-gravity dams, which combine some features of the two types of dams.

Other Types of Dams

Tailings dams impound industrial waste materials from mining operations or mineral processing.

Ash impoundments, or ponds, are used to store or dispose of ash generated primarily from the combustion of coal. These impoundments are a type of waste management facility consisting of an excavated, dammed, or diked reservoir in which coal ash is stored for future removal or disposed of as slurry or sludge. The coal ash solids settle out, and the water at the surface is discharged through a designed and managed outlet structure to a nearby stream, surface water, or plant process water system.

Spillway Discharge and Seepage

Water may pass from the reservoir to the downstream side of a dam by:

- Passing through the main spillway or outlet works
- Passing over an auxiliary spillway
- Overtopping the dam
- Seeping through a dam or abutment, or under a dam

Water normally passes through the main spillway or outlet works; it should pass over an auxiliary spillway only during periods of high reservoir levels and high water inflow.

A number of concrete dams have been designed to be overtopped. However, overtopping of an embankment dam is detrimental because the embankment materials may be eroded.

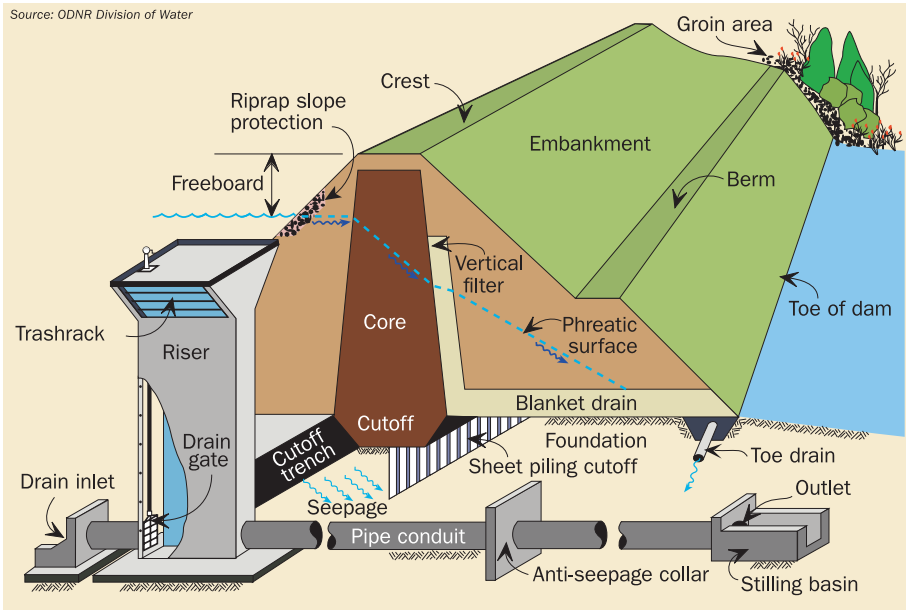
All embankment and most concrete dams have some seepage; controlling the seepage using proper dam construction, maintenance, and monitoring is important to prevent internal erosion and instability.

Release of Water

Intentional releases of water from dams are confined to spillways and outlet works. A dam typically has a principal or mechanical spillway and a drawdown facility. Additionally, some dams are equipped with auxiliary spillways to safely pass extreme floods.

Even when operated as designed, many dams will pass huge volumes of flood water into downstream areas.

Spillways are designed to prevent overtopping of dams. The most common type of spillway is the free-overflow spillway. This spillway may be constructed over or through the dam or an abutment. To permit maximum use of storage volume, movable gates are sometimes installed above the spillway crest to control discharge. Many smaller dams have a pipe and riser spillway to carry most flows and a vegetated earth or rock-cut spillway through an abutment to carry infrequent high flood flows. In dams such as those on the Mississippi River, flood discharges are of such magnitude that



Parts of a dam

the spillway occupies the entire width of the dam and the overall structure appears as a succession of vertical piers supporting movable gates. High arch-type dams in rock canyons usually have downstream faces too steep for an overflow spillway. In Hoover Dam on the Colorado River, for example, a shaft spillway is used. In shaft spillways, a vertical shaft upstream from the dam drains water from the reservoir when the water level becomes high enough to enter the shaft or riser; the vertical shaft connects to a horizontal conduit through the dam or abutment into the river below.

Outlet Works In addition to spillways, dams contain outlet works that allow water to be drawn, either continuously or as needed, from the reservoir, and provide a way to draw down the reservoir for repair or safety concerns. Water may be discharged into the river below the dam, run through generators to provide hydroelectric power, or used for irrigation. Dam outlets usually consist of pipes, box culverts, or tunnels with intake inverts near the minimum reservoir level. Such outlets are provided with gates or valves to regulate the flow rate.

What are the risks associated with dams?

Dam failures are low probability but high consequence events. Even so, they typically occur somewhere in the United States every year.

Although thousands of lives have been lost and substantial property damage has occurred as a result of dam failure, good planning and improved dam safety programs, as advocated in this brochure, have reduced loss of life and property damages dramatically in recent years.

Dam failures or partial failures are not usually caused by storm events. Most failures fall into one or more of the following categories:

Structural failures Foundation defects, including settlement and slope instability, or damage caused by earthquakes, have caused about 30 percent of all dam failures in the United States.

Mechanical failures Malfunctioning gates, conduits, or valves can cause dam failure or flooding both upstream and downstream and account for about 36 percent of all dam failures in the United States.

Hydraulic failures Overtopping of a dam is often a precursor to dam failure. National statistics show that overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest accounts for approximately 34 percent of all dam failures in the country.

These problems can lead to dam failure:

- Inadequate design criteria
- Malfunction of dam components
- Spillway damage or malfunction
- Seepage problems
- Embankment stability problems
- Damage from vandalism
- Improper operation

Thousands of dams nationwide are considered deficient and susceptible to failure because of these problems.

Planned Releases

Operation of spillways, either planned or in response to emergency situations, can create flooding and public safety hazards, even in the absence of a dam failure. During periods of extreme flow, dams may fill to capacity, necessitating emergency releases that can flood downstream areas. People swimming and fishing downstream of dams have been caught in spillway releases, at times with tragic results. Many dams incorporate sirens to warn the public of an impending release.

Recent Dam Failures

July 25, 2010 – Lake Delhi Dam, Delaware County, IA
The dam failure drained a 9-mile recreational lake and damaged or destroyed up to 300 homes.

January 6, 2009 – Private Dam, Etowah County, AL
After floodwaters washed away a culvert, a private dam broke and produced up to 12 feet of flooding in the area, which caused residences to be evacuated. A dozen roads were also closed as a result of floodwaters and property damage was reported to be $100,000.

December 22, 2008 – Kingston Coal Waste Dam, Roane County, TN
The Kingston Dam was a 40-acre pond used by the Tennessee Valley Authority to hold a slurry of ash generated by the coal-burning Kingston Steam Plant. The dam gave way just before 1 a.m., burying a road and railroad tracks leading to the plant under 5.4 million cubic yards (more than 1 billion gallons) of sludge, which damaged 12 homes and covered hundreds of acres. The cleanup cost was $1 million per day.

March 14, 2006 – Ka Loko Dam, Kauai, HI
The failure of an embankment dam in this relatively undeveloped area killed seven people and caused extensive environmental damage.

December 14, 2005 – Taum Sauk Dam, Lesterville, MO

The failure of this off-stream hydropower facility located high above Johnson's Shut-Ins State Park destroyed the home of the park superintendent and swept his family downstream. Miraculously, all survived. The flood washed out part of a State road and caused extensive environmental damage to the East Fork of the Black River and to the park, which in warm weather months is typically populated with hundreds of campers and hikers.

Historically Significant Dam Failures

February 26, 1972 – Buffalo Creek Valley, WV

The failure of a coal-waste impoundment at the valley's head took 125 lives and caused more than $400 million in damages, including the destruction of over 500 homes. This disaster wiped out 16 communities.

June 9, 1972 – Rapid City, SD

The Canyon Lake Dam failure took an undetermined number of lives (estimates range from 33 to 237). Damages, including the destruction of 1,335 homes, totaled more than $60 million.

June 5, 1976 – Eastern Idaho

Eleven people perished when Teton Dam failed. The failure caused an unprecedented amount of property damage totaling more than $1 billion. The failure flooded at least six communities and tens of thousands of acres.

July 19–20, 1977 – Laurel Run, PA

Laurel Run Dam failed, killing more than 40 people and causing $5.3 million in damages.

November 5, 1977 – Toccoa Falls, GA

Kelly Barnes Dam failed, killing 39 students and college staff and causing about $2.5 million in damages.

May 31, 1889 – Johnstown, PA

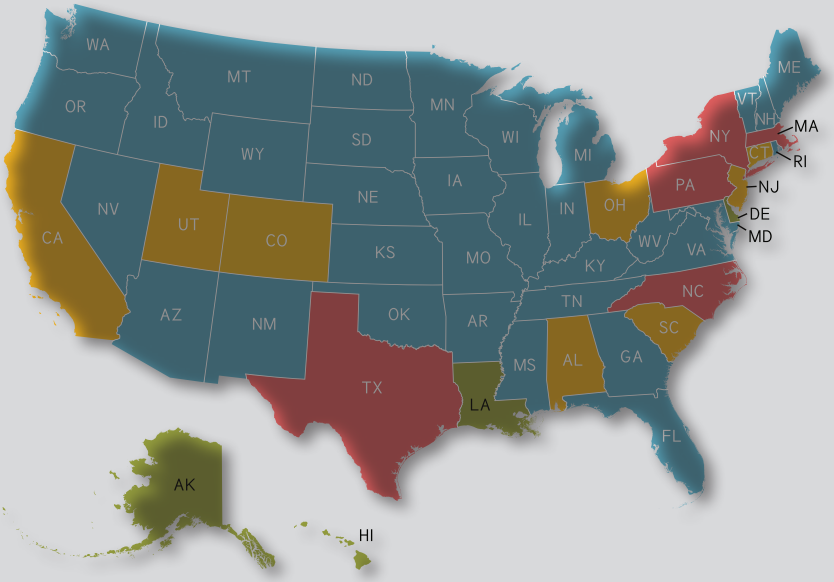
The deadliest dam failure in U.S. history took the lives of more than 2,200 people.

Am I or could I be affected by a dam and what area would flood if the dam failed?

Many people who live in dam breach inundation zones are completely unaware of the potential hazard lurking upstream.

The "inundation zone" is the area downstream of the dam that would be flooded in the event of a failure (breach) or uncontrolled release of water, and is generally much larger than the area for the normal river or stream flood event.

The "dam breach inundation zone" is larger than the 1-percent-annual-chance flood used on FEMA's Flood Insurance Rate Maps (FIRMs).



Number of high- and significant-hazard potential dams, i.e., those that have the potential to cause loss of life (high) or extreme property damage (significant) if they fail.

RED = More than 1,000 dams
YELLOW = Between 500 and 1,000 dams
BLUE = Between 100 and 500 dams
GREEN = 100 dams or less

NOTE:
Since Alabama is the only State that does not have a regulatory program, the number of reported dams may be low.

How do I find out if I live in a dam breach inundation zone?

- Contact your local emergency management agency (a simple Internet search will most likely locate the appropriate office).
- Contact your State dam safety program (see the U.S. map at www.damsafety.org).

Before buying:
Do some research, Know the facts

Before buying a home or business, determine whether it is in a dam breach inundation zone. This determination is the buyer's responsibility.

Prospective buyers should know whether there is an existing upstream dam or the potential for an upstream dam to be built. This is sometimes difficult to determine while standing on the property because the upstream dam may not be in sight. In some cases, the dam site may be several miles upstream of the property and the view may be obscured. Here are some resources that will assist your research:

- 7.5 minute U.S. Geological Survey topographic maps: http://topomaps.usgs.gov
- Google Earth
- The State dam safety agency office, the local emergency management office, or the local soil and water district office

Likewise, buying property on or near a manmade lake requires an understanding of what that proximity entails. Such properties tend to have higher values than similar sized properties not associated with a lake. The removal of the lake or a permanent lowering of the lake's water level can dramatically reduce property values on or near the lake. The fluctuation of the lake levels from normal pool to flood pool elevations can hinder or eliminate the use of the property and associated structures. In many cases the dam is owned by a neighborhood association of lakeside property owners who are responsible for the dam's maintenance and are liable for any risk posed by the dam.

Prospective buyers should learn of the risks, legal and financial liabilities, and other issues associated with the lake, dam, and control structures prior to the purchase of a home.

Changing weather patterns, erosion, and development can affect areas at risk from dam failure. FEMA is currently updating and modernizing its FIRMs (www.fema.gov/hazard/map/firm.shtm) to help the public better understand flood risk. FEMA has published almost 100,000 individual FIRMs. You can find your map and learn how to read it so you can make informed decisions about protecting your property, both financially and structurally at the FEMA Map Service Center (www.msc.fema.gov).

Currently, the dam breach inundation zones are NOT shown on Flood Insurance Rate Maps maps as areas requiring flood insurance. Even though it is not required, buying flood insurance to protect a financial investment in homes and businesses located below dams may be wise.

Visit www.FloodSmart.gov for more information on flood insurance.

Once I determine that my property is in a dam breach inundation zone, what's next?

Find out the dam's condition. Does it meet Federal or State safety criteria?

Contact your county emergency management coordinator or State dam safety program office to find out who owns the dam and which agencies regulate it. Contact information for State Dam Safety Programs is listed online at www.damsafety.org.

Ask questions about the dam's condition and hazard potential

State officials and the dam owner should be able to answer questions such as:

- ***What is the dam's hazard potential classification?***
- ***When was it last inspected?***
- ***What is its condition?***
- ***Is the owner financially capable of properly maintaining the dam?***
- ***Is there a plan in place in the event of a dam failure?***

Emergency Action Plans

One of the most important questions to ask State dam safety officials or dam owners is whether there is an up-to-date Emergency Action Plan (EAP) for the dam in question. An EAP is a formal document that identifies potential emergency conditions at a dam and specifies actions to reduce property damage and loss of life. The EAP includes actions the dam owner should take to mitigate problems at the dam and issue warnings to responsible emergency management authorities.

If you live or work in a dam breach inundation zone, find out your evacuation route so that you can quickly get out of harm's way in the event of a dam incident. To obtain this information, contact your State and local emergency management officials, who are responsible for evacuation planning and implementation.

Communication with emergency managers is key. Points to remember:

- Find out if there is an up-to-date EAP for the dam.
- Determine what types of warning systems are in place to warn residents of a dam incident. For example, are there sirens, a Reverse-911 phone

messaging system, bullhorns, or door-to-door warning procedures in place? Always heed warnings to leave.

- Find out how to get to a place of safety and what evacuation routes will be open.
- Ask about the location of community emergency shelters.
- Inform emergency management officials of family members who are handicapped or may need special assistance.

Prepare your home and your family

- Inform your family of dam failure flood risks, and make sure each family member knows what to do in the event of an emergency.
- Elevate your furnace, water heater, and electric panel if they are susceptible to flooding.
- Install "check valves" in sewer traps to prevent floodwater from backing up into drains.
- Seal basement walls with waterproofing compounds to avoid seepage.
- Keep valued possessions and important papers on an upper level of your home or in a safety deposit box.
- Prepare an emergency kit.

What should you do in the event of an emergency?

If a flood is likely in your area, you should:

- Listen to the radio or television for information.
- Be aware that dam failure or operational flooding can occur. If there is any possibility of a flash flood, move immediately to higher ground. Do not wait for instructions to move. Get to high ground if flooding is imminent.
- Be aware of streams, drainage channels, canyons, and other areas that may flood suddenly. Flash floods can occur in these areas with or without such typical warnings as rain clouds or heavy rain.

If you must prepare to evacuate, you should:

- Secure your home. If you have time, bring in outdoor furniture. Move essential items to an upper floor.
- Turn off utilities at the main switches or valves if instructed to do so. Disconnect electrical appliances. Do not touch electrical equipment if you are wet or standing in water.

If you have to leave your home, remember these evacuation tips:

- Do not walk through moving water. Six inches of moving water can make you fall. If you have to walk in water, walk where the water is not moving. Use a stick to check the firmness of the ground in front of you.
- Do not drive into flooded areas. If floodwaters rise around your car, abandon the car and move to higher ground if you can do so safely. You and the vehicle can be quickly swept away.

Do I need to buy flood insurance?

Because standard homeowners insurance doesn't cover flooding, it's important to have protection from the floods associated with hurricanes, tropical storms, heavy rains, dam failures, and other conditions that can affect your home or business.

In 1968, Congress created the National Flood Insurance Program (NFIP) to help property owners to financially protect themselves from floods. The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the NFIP. Participating communities agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding.

Flood insurance is highly recommended but not required for those living in dam breach inundation zones.

Just because you haven't experienced a flood in the past doesn't mean you won't in the future. Flood risk isn't based just on history. It's also based on a number of other factors: potential dam failure, rainfall, river-flow, topography, flood control measures, and changes due to development.

Dam Safety, Flood Risk, and Emergency Management Responsibilities

The Public

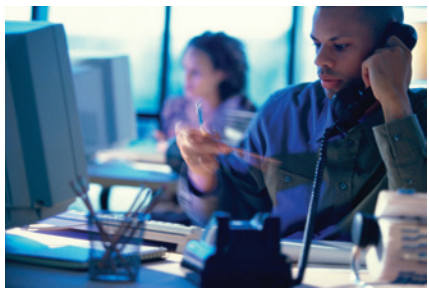
- Understand that you are at risk and that there are steps you can take now to protect yourself from floods should a dam fail or release flood waters.
- Know your evacuation routes.

Dam Owners and Operators

- Maintain and operate the dam properly to ensure that the dam does not fail.
- Work with State and local officials to mitigate the consequences of dam incidents.
- Maintain an EAP. Inform local officials of risks associated with the dam.
- Work with the Federal or State regulator to comply with safety standards.

State and Local Governments

- State governments are responsible for public safety regulation for more than 80 percent of the Nation's dams (non-Federal dams).
- State and local governments are responsible for determining how land is used in floodplains and for enforcing floodplain management regulations.
- Local governments are responsible for emergency response and evacuation in a flooding situation.



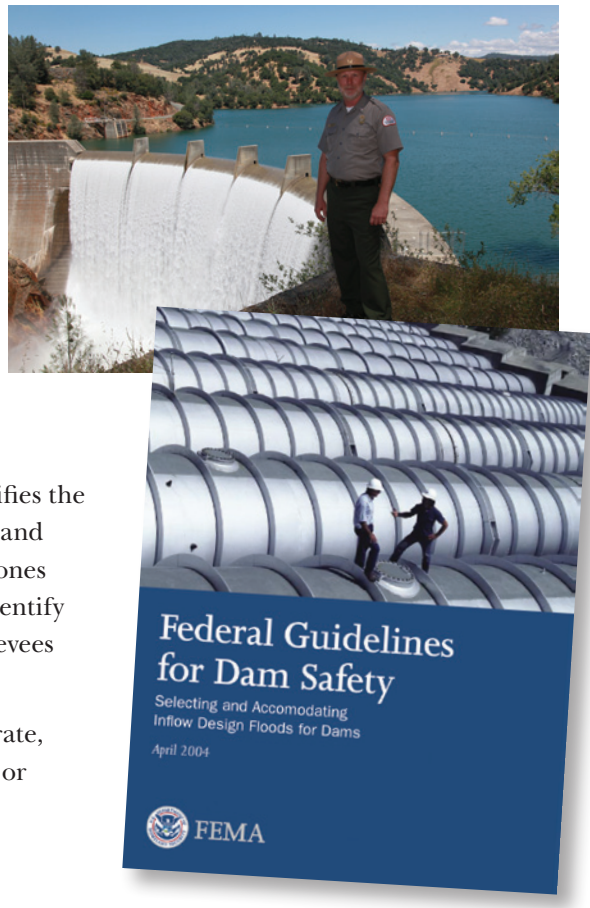
What is the 1-percent-annual-chance flood?

FEMA uses the 1-percent-annual-chance flood standard (the flood that has a 1 percent annual chance of being equaled or exceeded) to define floodplain boundaries on FIRMs, which are used for insurance purposes, floodplain management, and planning efforts. Areas within the 1-percent-annual-chance floodplain are known as Special Flood Hazard Areas (SFHAs).

- Within an SFHA, you have a 26 percent chance of experiencing a flood of that magnitude or greater during the life of a 30-year mortgage. You would have a 4 percent chance of experiencing a fire during the same period of time.
- Dam breach inundation zones may far exceed the 1 percent flood zones mapped by FEMA.
- Floods greater than a 1-percent-annual-chance flood can and do happen; the Midwest experienced two 0.2-percent-annual-chance floods in a 15-year period (in 1993 and 2008).
- Dam failure floods are almost always more violent than the normal stream, river, or coastal floods.

Federal Dam Safety, Floodplain, and Emergency Management Programs

- Several Federal agencies have built or own dams, including the U.S. Army Corps of Engineers, the Department of the Interior, the Tennessee Valley Authority, and the Department of Agriculture. Collectively, the Federal Government owns 3,225 dams (2010 data). The Department of Agriculture's Natural Resources Conservation Service helped build more than 11,000 dams now owned by local watershed districts.
- Some Federal agencies, including the Federal Energy Regulatory Commission (FERC) and the Mine Safety and Health Administration (MSHA), regulate privately owned dams. According to the National Inventory of Dams, FERC and MSHA collectively regulate more than 2,200 dams (2010 data).
- FEMA provides Federal, State, and local governments with valuable data for assessing and reducing flood risks to people and their homes and businesses.
- FEMA analyzes and identifies the flood hazards near levees and dam breach inundation zones and helps communities identify the risks associated with levees and dams.
- FEMA does not own, operate, maintain, or certify dams or levees for safety.



RESOURCES for Citizen Involvement

Association of State Dam Safety Officials:
www.damsafety.org

Dam Safety Action:
www.damsafetyaction.org

National Dam Safety Program:
www.fema.gov/plan/prevent/damfailure/ndsp.shtm

National Inventory of Dams:
http://nid.usace.army.mil

American Society of Civil Engineers Infrastructure Report Card – Dams:
www.infrastructurereportcard.org/fact-sheet/dam

FEMA FloodSmart:
www.floodsmart.gov

USDA Natural Resources Conservation Service Watershed Rehabilitation Information:
www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wr

National Weather Service, River Observations and Forecasts:
http://water.weather.gov/ahps/

The National Emergency Management Association:
www.nemaweb.org

The International Association of Emergency Managers:
www.iaem.com

Find out more about the maps used to determine flood risk:
National Flood Insurance, Program Customer Service
888-379-9531
TTY: 800-427-5593
Fax: 202-646-2818
E-mail: FloodSmart@dhs.gov
Mail: FEMA, 500 C Street SW, Washington, D.C. 20472

Contacting FEMA:

For a comprehensive list of contact information, please see the FEMA Web site: www.fema.gov

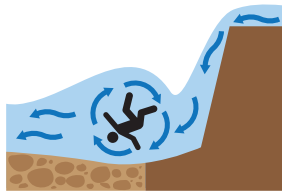
FEMA publishes maps indicating a community's flood hazard areas and the degree of risk in those areas. Flood insurance maps are usually on file in a local repository in the community, such as the planning and zoning or engineering offices in the town hall or the county building.

In addition, you can order maps online or by writing, telephoning, or faxing a request to the FEMA Map Service Center: www.msc.fema.gov, P.O. Box 3617 Oakton, Virginia 22124-9617 Tel: (877) 336-2627 Fax: (703) 212-4090 E-mail: MSCservices@riskmapcds.com

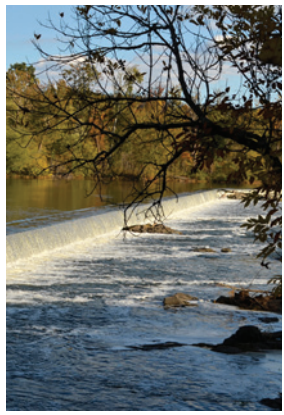
Public Safety

Aside from the possibility of floods due to dam failure, dams also pose risks to swimmers, fishermen, and boaters.

Small dams, also known as low-head dams, "killer dams," or "drowning machines," are deceptively dangerous. These dams are especially dangerous to swimmers and boaters because they are often hard to see, especially from the upstream side. Boaters who go over a low-head dam are often trapped in a submerged hydraulic jump or "roller" formed just below the dam. Likewise, swimmers and fishermen who get too close to dams can be caught in this dangerous circulating current.



Hundreds of people have been killed at low-head dams, but few States regulate these dangerous structures.

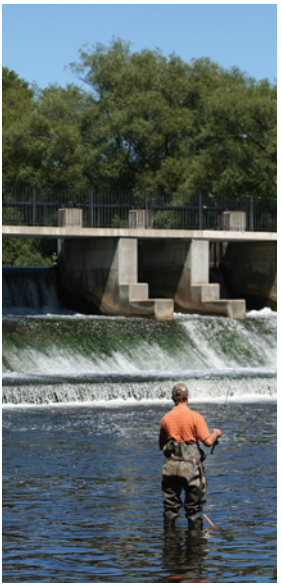


Stay safe around dams

SOURCE: Ontario Ministry of Natural Resources Web site, 2012.

Summer

- Always stay outside booms and away from all dam structures.
- Never swim above a dam or dive from a dam structure. Currents can pull you through the dam or pull you against flow structures with such force that you cannot escape.
- Never fish, boat, or swim below a dam. Water levels and flows can change very quickly, and you may not be able to react in time to avoid the danger.
- Never moor, tie, or anchor your boat below a dam. Always keep personal watercraft and boats clear of dams.
- Never sunbathe, picnic, or camp in an area that may flood as a result of dam operations.



Autumn

- Be aware of possible changes in water flows or levels from dam operations when operating an All-Terrain Vehicle (ATV). ATVs should be used with caution around water.
- Always obey posted signs, and do not enter fenced areas to hike or access hunting or nature viewing areas.

Winter

- Beware of thin ice that may develop as a result of dam operations.
- Never venture out on the ice alone. Always wear a life jacket and carry a throw rope.
- Always be aware of the potential for slush under the snow when venturing out on the ice. Dam operations often result in lowering of water levels throughout the winter and spring. However, this can result in ice collapsing onto lower water levels and then water seeping up under the snow. Travel in slush conditions is very difficult regardless of the mode of travel.

Spring

- Stay clear of dams when fishing. Water flows and levels can change quickly.
- Always stay clear of dams when canoeing and kayaking.

General

- Stay off the dam structures unless the area is clearly marked for public travel.
- Be alert to changes in water levels.

FEMA

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251034

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Karen Mulvany Comments on EIR for TGPA and ZOU - 4

1 message

Karen Mulvany <kmulvany@gmail.com> Wed, Jul 23, 2014 at 3:07 PM
To: TGPA-ZOU@edcgov.us

Please find Exhibit 5 out of a total of 6 that goes with my comment letter on the EIR.

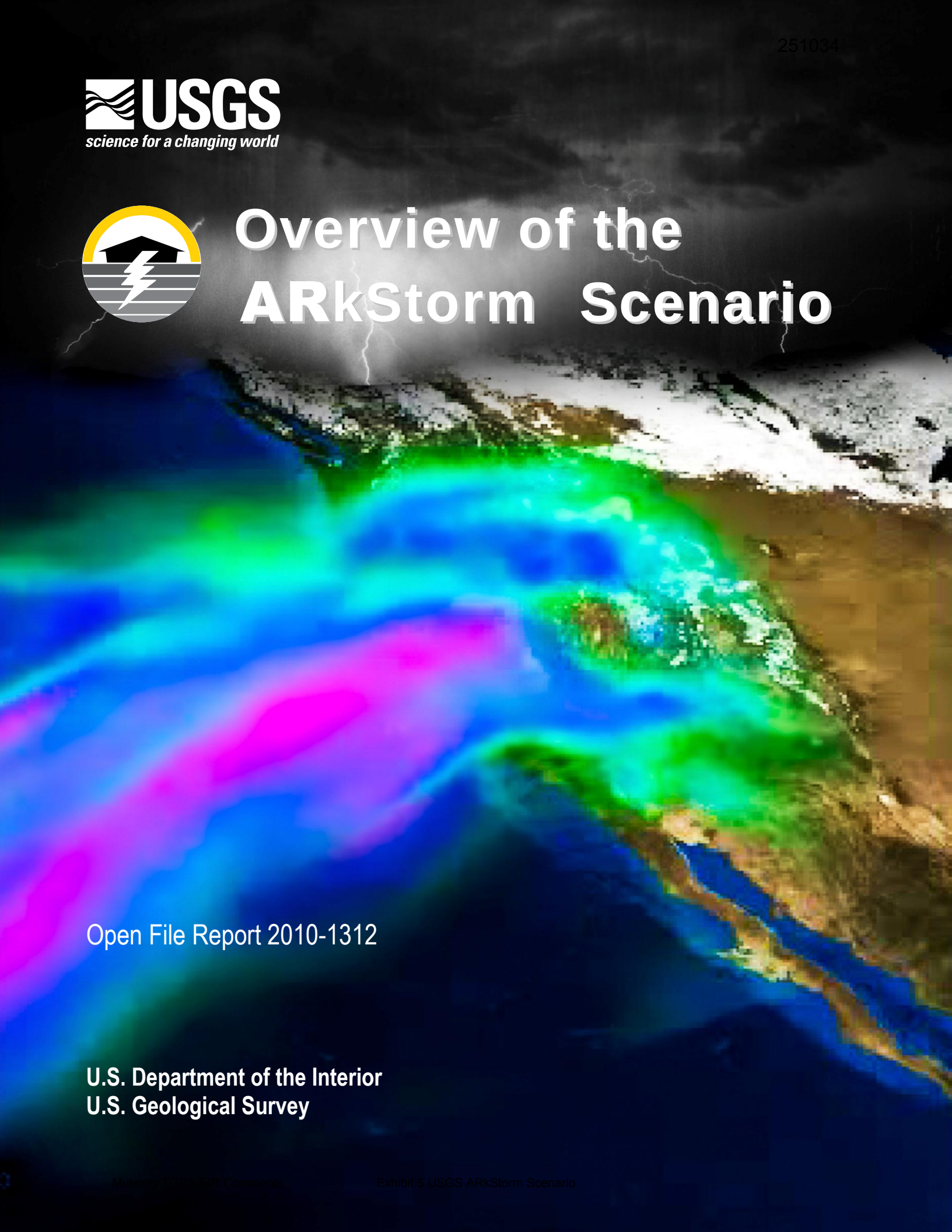
Thank you,

Karen Mulvany

Exhibit 5 2011 USGS ARkStorm Scenario.pdf
11577K

USGS
science for a changing world

Overview of the ARkStorm Scenario



Open File Report 2010-1312

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Overview of the Arkstorm Scenario

Prepared for the U.S. Geological Survey Multihazards Demonstration Project
Lucile Jones, Chief Scientist
Dale Cox, Project Manager

By

Keith Porter[18], Anne Wein[17], Charles Alpers[17], Allan Baez[1], Patrick Barnard[17], James Carter[17], Alessandra Corsi[7], James Costner[20], Dale Cox[17], Tapash Das[14], Michael Dettinger[17], James Done[12], Charles Eadie[8], Marcia Eymann[5], Justin Ferris[17], Prasad Gunturi[20], Mimi Hughes[13], Robert Jarrett[17], Laurie Johnson[10], Hanh Dam Le-Griffin[16], David Mitchell[11], Suzette Morman[17], Paul Neiman[13], Anna Olsen[18], Suzanne Perry[17], Geoffrey Plumlee[17], Martin Ralph[13], David Reynolds[13], Adam Rose[19], Kathleen Schaefer[6], Julie Serakos[20], William Siembieda[4], Jonathan Stock[17], David Strong[17], Ian Sue Wing[2], Alex Tang[9], Pete Thomas[20], Ken Topping[15], and Chris Wills[3].

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[16] TTW, Inc.
[17] U.S. Geological Survey
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KEN SALAZAR, Secretary

U.S. Geological Survey
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U.S. Geological Survey, Reston, Virginia 2011

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Abstract

The U.S. Geological Survey, Multi Hazards Demonstration Project (MHDP) uses hazards science to improve resiliency of communities to natural disasters including earthquakes, tsunamis, wildfires, landslides, floods and coastal erosion. The project engages emergency planners, businesses, universities, government agencies, and others in preparing for major natural disasters. The project also helps to set research goals and provides decision-making information for loss reduction and improved resiliency. The first public product of the MHDP was the ShakeOut Earthquake Scenario published in May 2008. This detailed depiction of a hypothetical magnitude 7.8 earthquake on the San Andreas Fault in southern California served as the centerpiece of the largest earthquake drill in United States history, involving over 5,000 emergency responders and the participation of over 5.5 million citizens.

K Street, Sacramento, looking east 1861-1862

This document summarizes the next major public project for MHDP, a winter storm scenario called ARkStorm (for Atmospheric River 1,000). Experts have designed a large, scientifically realistic meteorological event followed by an examination of the secondary hazards (for example, landslides and flooding), physical damages to the built environment, and social and economic consequences. The hypothetical storm depicted here would strike the U.S. West Coast and be similar to the intense California winter storms of 1861 and 1862 that left the central valley of California impassible. The storm is estimated to produce precipitation that in many places exceeds levels only experienced on average once every 500 to 1,000 years.

Extensive flooding results. In many cases flooding overwhelms the state's flood-protection system, which is typically designed to resist 100- to 200-year runoffs. The Central Valley experiences hypothetical flooding 300 miles long and 20 or more miles wide. Serious flooding also occurs in Orange County, Los Angeles County, San Diego, the San Francisco Bay area, and other coastal communities. Windspeeds in some places reach 125 miles per hour, hurricane-force winds. Across wider areas of the state, winds reach 60 miles per hour. Hundreds of landslides damage roads, highways, and homes. Property damage exceeds $300 billion, most from flooding. Demand surge (an increase in labor rates and other repair costs after major natural disasters) could increase property losses by 20 percent. Agricultural losses and other costs to repair lifelines, dewater (drain) flooded islands, and repair damage from landslides, brings the total direct property loss to nearly $400 billion, of which $20 to $30 billion would be recoverable through public and commercial insurance. Power, water, sewer, and other lifelines experience damage that takes weeks or months to restore. Flooding evacuation could involve 1.5 million residents in the inland region and delta counties. Business interruption costs reach $325 billion in addition to the $400 billion property repair costs, meaning that an ARkStorm could cost on the order of $725 billion, which is nearly 3 times the loss deemed to be realistic by the ShakeOut authors for a severe southern California earthquake, an event with roughly the same annual occurrence probability.

The ARkStorm has several public policy implications: (1) An ARkStorm raises serious questions about the ability of existing federal, state, and local disaster planning to handle a disaster of this magnitude. (2) A core policy issue raised is whether to pay now to mitigate, or pay a lot more later for recovery. (3) Innovative financing solutions are likely to be needed to avoid fiscal crisis and adequately fund response and recovery costs from a similar, real, disaster. (4) Responders and government managers at all levels could be encouraged to conduct risk assessments, and devise the full spectrum of exercises, to exercise ability of their plans to address a similar event. (5) ARkStorm can be a reference point for application of Federal Emergency Management Agency (FEMA) and California Emergency Management Agency guidance connecting federal, state and local natural hazards mapping and mitigation planning under the National Flood Insurance Plan and Disaster Mitigation Act of 2000. (6) Common messages to educate the public about the risk of such an extreme disaster as the ARkStorm scenario could be developed and consistently communicated to facilitate policy formulation and transformation.

These impacts were estimated by a team of 117 scientists, engineers, public-policy experts, insurance experts, and employees of the affected lifelines. In many aspects the ARkStorm produced new science, such as the model of coastal inundation. The products of the ARkStorm are intended for use by emergency planners, utility operators, policymakers, and others to inform preparedness plans and to enhance resiliency.

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Introduction

Naming the ARkStorm. A California storm is known by the year in which the storm occurred. To equate the storm in a person's mind requires some visceral knowledge of the event, or some understanding of history, meteorology, hydrology, engineering, or other relevant technical discipline. Even with that knowledge, the naming convention does not communicate the magnitude of the event. Therefore, the ARkStorm scenario was named so as to be independent of time, to acknowledge the meteorological phenomena behind most large storms on the U.S. West Coast, namely Atmospheric Rivers (ARs), and to provide some future scale to compare past and future events. The hypothetical scenario would be an Atmospheric River, AR with a value of 1,000 (k), or an ARkStorm.

The Multihazards Demonstration Project. The ARkStorm Scenario is the second major project of the U.S. Geological Survey (USGS) Multi-Hazards Demonstration Project (MHDP). The goal of the MHDP is to improve community resiliency to natural hazards through the application of science from a variety of disciplines. Early in the project, the MHDP gathered together decision makers and emergency managers in southern California and asked them what they wanted from science. Larry Collins, a Captain in the Los Angeles County Fire Department, Urban Search and Rescue, said:

> "In California, the emergency services deal with disasters as a matter of course. It's the catastrophic events that push us to our limits. We look to science to help us better prepare for catastrophes. By preparing for catastrophes, we can deal with disasters that much better."

There is much to learn from hypothetical catastrophes. To address southern California's catastrophic vulnerability to earthquake, the MHDP created the ShakeOut Earthquake Scenario. This scenario was the most comprehensive earthquake scenario ever devised, postulating a hypothetical magnitude 7.8 earthquake on the southern section of the San Andreas Fault. The scenario document (Jones and others, 2008) examined in detail the geophysical, physical, and social implications of a massive earthquake. This scenario was created by a team of more than 300 scientists and other experts. The ShakeOut scenario served as the centerpiece of the 2008 Great Southern California ShakeOut, the largest earthquake preparedness drill ever, with over 5.4 million participants. The ShakeOut is now an annual statewide event and the basis of the federal and state Catastrophic Earthquake Plan.

By postulating a hypothetical catastrophe, scientists and engineers can better examine the interdependencies in our social structure and infrastructure and expose the choke-points and vulnerabilities. In one of many examples in the ShakeOut scenario, we learned that all lifelines into and out of southern California cross the San Andreas Fault, most notably electrical transmission lines, oil and natural gas lines, water conveyance, telecommunications, highways, and railroads.

Everyone talks about The Big One, but what exactly does "The Big One" mean? Californians understand to some extent their vulnerabilities to earthquake. The idea of "the Big One" is ubiquitously understood to mean a very large earthquake that California will eventually experience. For many people this event exists in imagination extrapolated from movies and possibly from personal experience in damaging earthquakes they have actually lived through, such as the 1989 Loma Prieta or 1994 Northridge earthquake. Having personal experience and an awareness that a much larger earthquake has and will occur, helps people understand the need for earthquake risk mitigation. Both elements—personal experience and a cinematic or other basis for extrapolation—are largely missing from the public's understanding of catastrophic winter storms. Storms in the public's own experience have caused inconvenience but not major societal impacts.

So although potentially catastrophic storms have occurred in the past, these storms are beyond living memory, and so are less real to many people. Storms also are less sudden, less dramatic, and thus loom smaller than earthquakes do in the imagination of risk. But the evidence shows these storms do pose a real risk to California, in some ways far greater than that of earthquakes. One sequence occurred almost 150 years ago.

Winter storms of 1861-1862. Beginning in early December 1861 and continuing into early 1862, an extreme series of storms lasting 45 days struck California. The storms caused severe flooding, turning the Sacramento Valley into an inland sea, forcing the state capitol to be moved temporarily from Sacramento to San Francisco, and requiring Governor Leland Stanford to take a rowboat to his inauguration. William Brewer, author of "Up and down California," wrote on January 19, 1862, "The great central valley of the state is under water-the Sacramento and San Joaquin valleys-a region 250 to 300 miles long and an average of at least twenty miles wide, or probably three to three and a half millions of acres!"

The 1861-62 series of storms were the largest and longest California storms in the historic record, but were probably not the worst California has experienced. Geological evidence indicates that floods that occurred before Europeans arrived were bigger. Scientists looking at the thickness of sediment layers collected offshore in the Santa Barbara and San Francisco Bay areas have found geologic evidence of megastorms that occurred in the years 212, 440, 603, 1029, 1418, and 1605, coinciding with climatological events that were happening elsewhere in the world. There is no scientific evidence to suggest that such extreme storms could not happen again.

About the storms of 1861-62, Marcia Eymann, History Manager, Center for Sacramento History, writes:

Some capital-city residents opted to ignore the obvious danger and attempted to enjoy the perceived novelty of the event. Historians Thompson and West write that "every balcony was crowded with spectators, and mirth and hilarity prevailed. However hard these citizens tried to enjoy the flood, they soon found it difficult to do so in the face of so much destruction.

The levees remained intact, trapping flood waters inside the city. Residents were subject to hurricane-force winds and ice-cold, muddy water. The chain gang was charged with the dangerous task of breaching the R Street levee to relieve Sacramento of the excess water. Once it was breached, the force of the rushing water was so great that it took twenty-five homes with it, some of which were two stories tall. Sacramento remained under water for three months while four hundred families were left homeless and five thousand people were in need of aid.

San Francisco preacher S.C. Thrall explained that the great storm's visitation to California was simply God's way of punishing the nation for the sins of greed and pride. In early 1862 he proclaimed, "He who visited the nation with war, has smitten us with flood ... That this calamity is our part of the punishment of national sin seems especially evident from the fact that the visitation is so precisely coincident with the portion of our inhabited territory which has escaped the consequences of war."

To demonstrate and prepare people for the risks associated with an event analogous to the 1861-62 series of storms, the MHDP began the ARkStorm scenario on October 28, 2008. As with the ShakeOut earthquake scenario, the MHDP and its many contributing scientists created a hypothetical, but scientifically defensible storm scenario and then in detail examined the risks associated with that storm, including the potential impact on our buildings, infrastructure, water supply, transportation, agriculture, environment, and economy.

This is the ARkStorm. This document summarizes the environmental effects, physical damages, economic and other losses in California as a result of the hypothetical flooding and high winds associated with the ARkStorm scenario. ARkStorm is an emergency planning scenario associated with a hypothetical severe winter storm striking California, imagined to begin on January 19, 2011. The scenario was designed by a collaborative group led by the U.S. Geological Survey, California Geological Survey, and others, under the authority of the U.S. Geological Survey Multi-Hazards Demonstration Project for Southern California.

ARkStorm Meteorology

We begin with a brief history of extreme weather in California, touching on the historic precedent supporting the ARkStorm realism, especially the 1861-1862 severe storms that caused inundation throughout northern and southern California (fig. 1). These storms, and indeed most severe precipitation in California, were probably the result of a phenomenon termed atmospheric rivers, jets of warm moist air that originate over the mid-latitude north Pacific Ocean and transport that moisture to California where much of the moisture turns to rain and snow that falls on the state (fig. 2; *http://www.noaanews.noaa.gov/stories2005/s2529.htm*)

Figure 1. K Street, Sacramento, looking east, in January or February 1862. (Photographers Lawrence and Houseworth, The Bancroft Library Pictorial Collection, University of California, Berkeley)

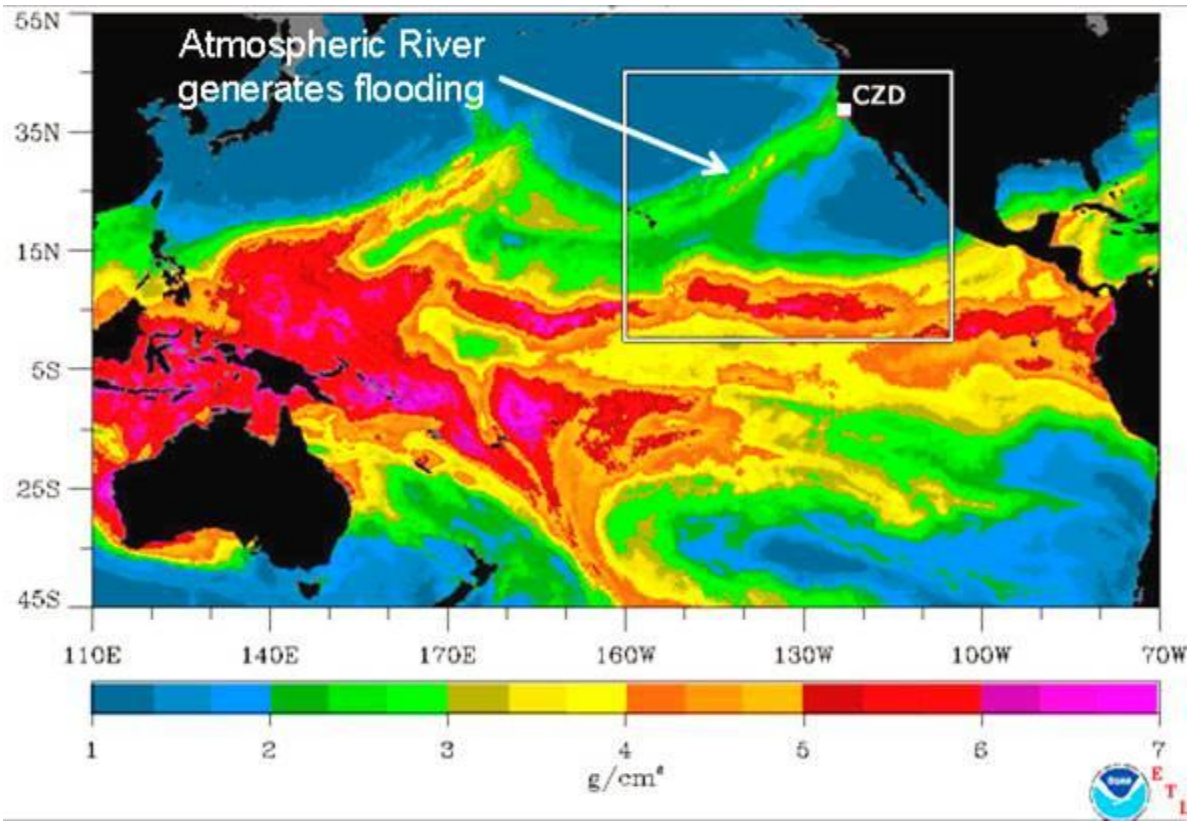

Figure 2. This map of the Pacific region shows an Atmospheric River originating over the central Pacific on February 16, 2004, indicated by high (green) vertically integrated water-vapor contents, in grams per square centimeter of water vapor, in the atmosphere extending from around Hawaii to the central California coast near the town of Cazadero (CZD).

These atmospheric rivers, the meteorological conditions that produce them, and the resulting precipitation and winds that affect California, can be simulated by using computer models. These models are based on observations of atmospheric conditions, plus laws of fluid dynamics and thermodynamics that allow us to fill in the gaps between observations.

This technique was done for ARkStorm. The modeling was led by Mike Dettinger and Marty Ralph of the USGS and National Oceanic Atmospheric Administration (NOAA), respectively, along with a team of 13 others from Scripps Institution of Oceanography, the National Weather Service, the California Extreme Precipitation Symposium, Golden Gate Weather, San Francisco State University, the Western Regional Climate Center, and the California Department of Water Resources. For technical details of this modeling, Dettinger and others have a paper in progress (M. Dettinger, written commun., 2009).

The modelers employed the Global Climate Model (GCM)—a computer model that depicts the climate of the world over time at a fairly large scale, on the order of 150 kilometer (km) horizontal grid—and nested within a portion of the model over California they used a detailed climate model termed the Weather Research and Forecasting (WRF) model, which depicts weather in nested domains each resolving smaller scales (fig. 3). From innermost to outermost boxes, the grid spacings are 2 km (black box), 6 km (black), 18 km (blue) and 54 km (red) (Dettinger and others written commun., 2009). Encoding the laws of fluid dynamics and thermodynamics in

equations that operate on meteorological parameters such as temperature, pressure, moisture content, and windspeed, the model calculates these parameter values at each grid point in the model and at each time step (here, about 30-second increments) during whatever duration is of interest. One can record all the parameter values at each grid point and time step, but for practical purposes, it is generally only necessary to record certain key parameters at larger time steps for later use, such as to make the maps shown later.

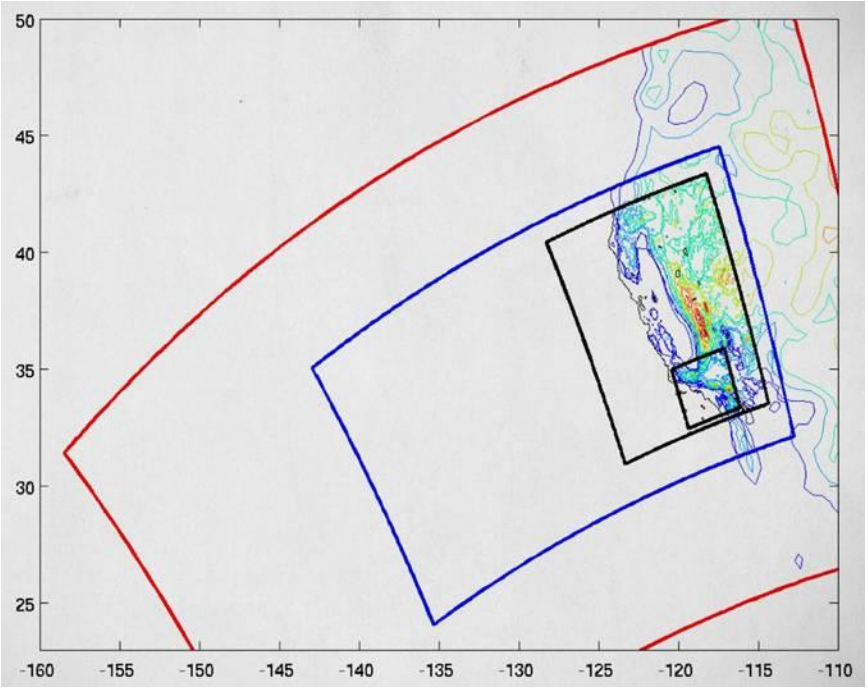

Figure 3. Weather Research and Forecasting (WRF) model domains used in simulations of ARkStorm meteorology, with nested model domains indicated by boxes and the topography resolved by the grids in each domain indicated by contours. Grid spacings are 2 km in smaller black box, 6 km in larger black box, 18 km in blue area, and 54 km in red area.

To use the GCM and WRF models requires one to establish what are called boundary conditions, meaning the constraints or inputs at the temporal and spatial boundaries of the model. To have any faith in the boundary conditions and the model results, it also helps to have some actual physical observations with which one can compare the model's output. Because the 1861-1862 storm occurred at a time before extensive detailed and generally reliable measurement of precipitation, barometric pressure, and wind speeds, we did not attempt to model the 1861-1862 storms directly, which would have required too many arbitrary assumptions, and instead simulated a repetition of two actual storms in recent history for which boundary conditions are known. In particular, the ARkStorm is a hybrid of a storm that struck southern California from January 19-27, 1969, followed without delay or interruption by a repetition of the storms that struck northern California from February 8-20, 1986, (fig. 4). That is to say, the GCM and WRF models were used to calculate and record the windspeed, barometric pressure, precipitation, and other weather parameters at each grid point on an hourly basis for 217 hours of a hypothetical storm that merges these two real events. The ARkStorm adds to these two storms a 24-hour period at the height of the

January 1969 storm in which the storm is imagined to stall, so as to produce a sufficient amount of precipitation to approximately match the limited observations of 1861-1862.

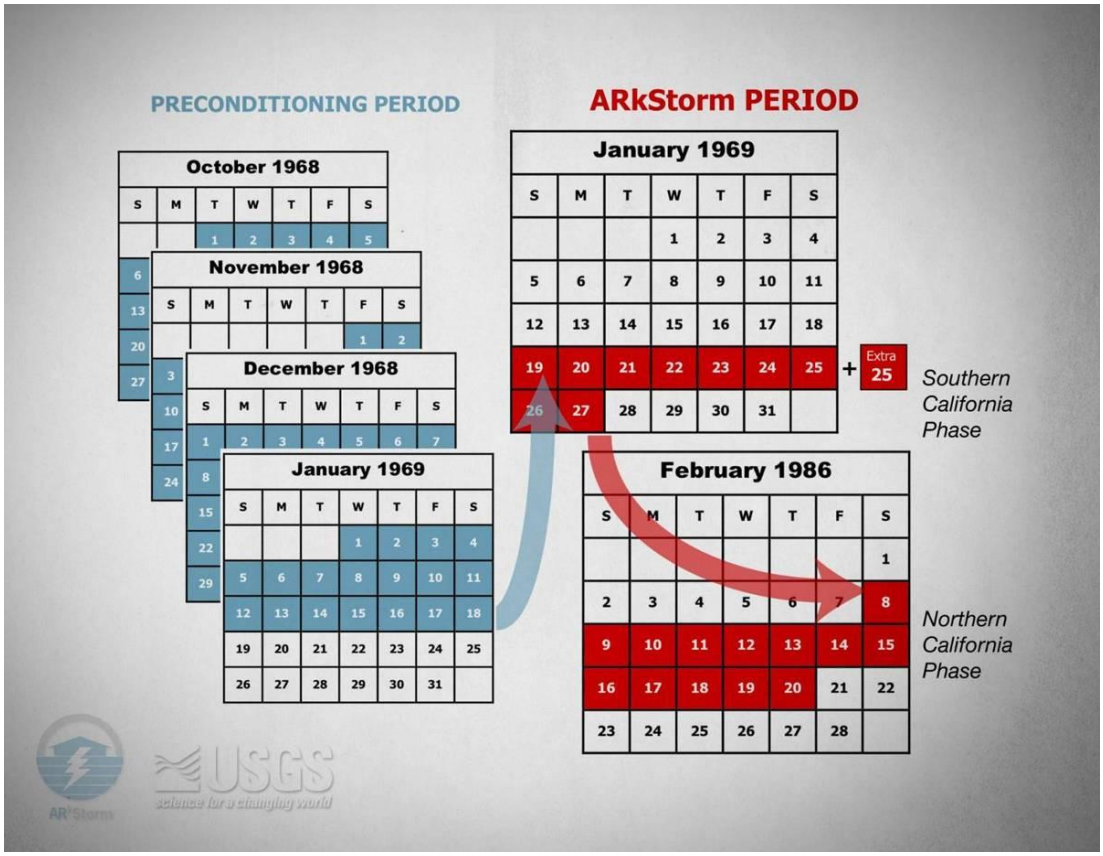

Figure 4. ARkStorm stitched-storm calendar, with moderately wet conditions of autumn and early winter "preconditioning" the watersheds of California for rapid flood generation indicated by blue shading, followed by the two intense-storm periods that were combined to make up the ARkStorm scenario indicated in red shading. These calendars represent actual storms of 1969 and 1986, which provided the basis for the ARkStorm modeling.

Using the modeled ARkStorm precipitation and temperatures, along with a macro-scale hydrology model termed the variable infiltration capacity model, the research team estimated the runoff generated by the ARkStorm, on an approximately 8-km grid throughout most of the state. Here, runoff means the rainfall that neither seeps into the ground or flora nor evaporates, but instead runs overland toward streams and ultimately the Pacific Ocean.

The meteorology team compared this modeled ARkStorm runoff with extreme-value statistics of runoff generated by the model for water years 1916-2003. In particular, the team fit a type-III log-Pearson parametric distribution to the yearly maximum 1- 3- and 7-day runoff volume in each grid cell, by using the statistics of these 87 years of simulation. One can compare the ARkStorm runoffs to this distribution to find the approximate return period of ARkStorm runoff in each grid cell. By return period, we mean the average number of years one would have to wait to observe storms generating at least that level of runoff. The calculation requires one to assume that the period 1916-2003 is representative of the future (reasonable, although climate change makes the assumption increasingly questionable the farther into the future we project), and that the type-

III log-Pearson parametric distribution is a reasonable approximation of the true probability distribution of runoff volume (a common assumption). Given this model, as shown in figure 5, ARkStorm produces runoff with a return period that varies between 10 years and 1,000 years, depending on location, relative to an historic simulation of water years 1916-2003 (Dettinger and others, written commun., 2009). Bear in mind that a storm can produce very high, rare runoff in one location and very low, commonly observed runoff in another, and no directly produced runoff in a third, so the runoff return period varies spatially for any given storm.

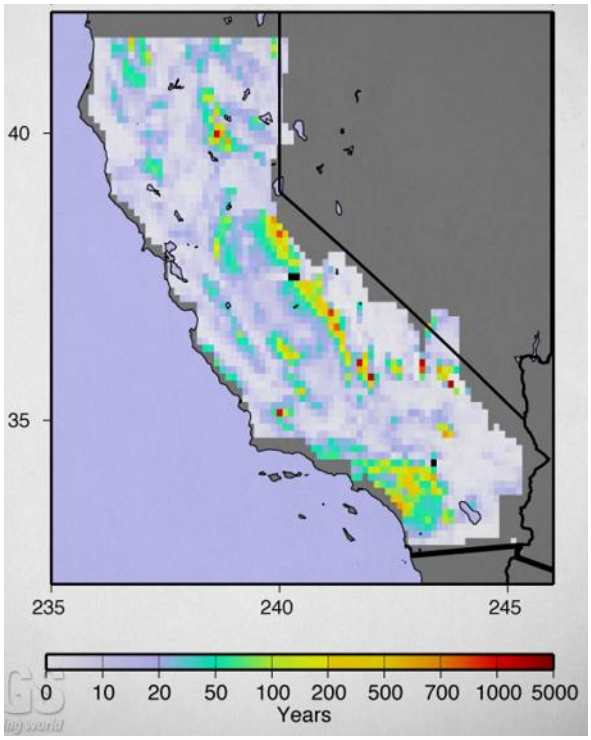

Figure 5. For locations around California, colors depict recurrence intervals in years of maximum 3-day runoff during the ARkStorm scenario.

FLOODING

The runoff map was interpreted to produce a map of flooding. The map was generated by a team led by Justin Ferris of the USGS, with 14 others from the USGS, University of Colorado, Federal Emergency Management Agency (FEMA), the Michael Baker Corporation, California Department of Water Resources, and NOAA. Note that the FEMA and Michael Baker Corporation representatives are currently responsible (at least during the period October 2009-April 2010) for accrediting levees in California for purposes of establishing digital flood information rate maps (dFIRMs).

Although a statewide analysis of the expected runoff is estimated by the meteorology modeling effort, this runoff is calculated on an 8 km grid, which is insufficient to estimate the runoff at specific locations with a great level of confidence. Ideally we would have performed a detailed statewide hydrological and hydraulic analysis for the storm to estimate flooding. However, there are two key challenges to such an approach that we could not overcome during this project: (1) no such model currently (2010) exists, and we could not create one within the available time and

budget, and (2) a number of variables cannot be modeled: for example, levee breaks occur in real storms, but the first such occurrence invalidates the current (2010) routing models. Existing models (2010) are of (1) such a comparatively small scale, (2) mutually incompatible in terms of input/output, and (3) not designed to function with such large and supercritical flows as to render their inclusion in this study effectively useless.

Figure 6 illustrates the first point: this figure shows the California Department of Water Resources web-based Integrated Water Resources Information System (IWRIS). The mesh shows the extent of the C2VSIM hydrologic model, which encompasses the Central Valley of California and is used for water planning purposes. The model covers the other three hydrologic and hydraulic models encoded in IWRIS. Note the lack of coverage of San Diego, Orange, Los Angeles, San Bernardino, and Santa Clara Counties, which are potentially among the most seriously flooded. However, even if the C2VSIM model had a hydraulic component and could handle the volume of at-site runoff produced by the meteorological models (that is, non-steady, supercritical flow conditions), the few other smaller models we identified would not be able to process the output from the C2VSIM model. The lack of a common set of input/output parameters between the existing models for the State of California prevented the usage of those models for even a part of the state. In other words, the numeric models we identified could not communicate with each other, and illustrated a need for either a statewide hydrologic and hydraulic models, or at least the establishment of a common protocol for model inputs and outputs that would allow smaller, local models to work together to simulate larger flood events.

We, therefore, used the FEMA dFIRMs as proxies. Two kinds of proxies are available: one that shows the boundaries of flooding with 500-year return period, and one that shows boundaries of flooding with 100-year return period. The reader should understand that "return period" refers to the average number of years between similar events. Return period does not mean that these levels of flooding happen like clockwork regularly every 100 or 500 years. Moreover, the return period does not mean that danger is over if a 100- or 500-year flood has just occurred. Rather, a 100-year return period simply means that the probability that such flooding will occur next year is estimated to be 1 in 100, or 1percent probability. Similarly, flooding with 500-year return period has an estimated 0.2 percent probability of occurrence next year.

In hydrologic-unit-code-6 watersheds (HUC6, fig. 7) where the runoff map indicated runoff on the order of 250 to 1,000-year return period, we hypothesized that the ARkStorm could realistically generate flooding that fills the 500-year dFIRM boundaries. In HUC6 watersheds where the ARkStorm runoff map shows runoff with return period between 25 and 250 years, we hypothesized that the ARkStorm could realistically generate flooding that fills between 10 and 30 percent of the 100-year dFIRM boundaries.

The 10 to 30 percent of the 100-year boundary that is to be considered inundated is often that part of the floodplain that is closest to the river, but subject to some judgment, based in part on FEMA staff's knowledge of the state flood protection system. Given that this method is an approximation, admittedly the designation of certain parts of the floodplain as inundated will be viewed by some as arbitrary. We readily acknowledge this shortcoming, but feel this model gives the best available approximation of the inundated area. A more-rigorous determination of inundated area would require the translation of the estimated runoff value at each location to an area of inundation based on detailed analysis of local hydrology and hydraulics, which was beyond the funding and time scope of this exercise.

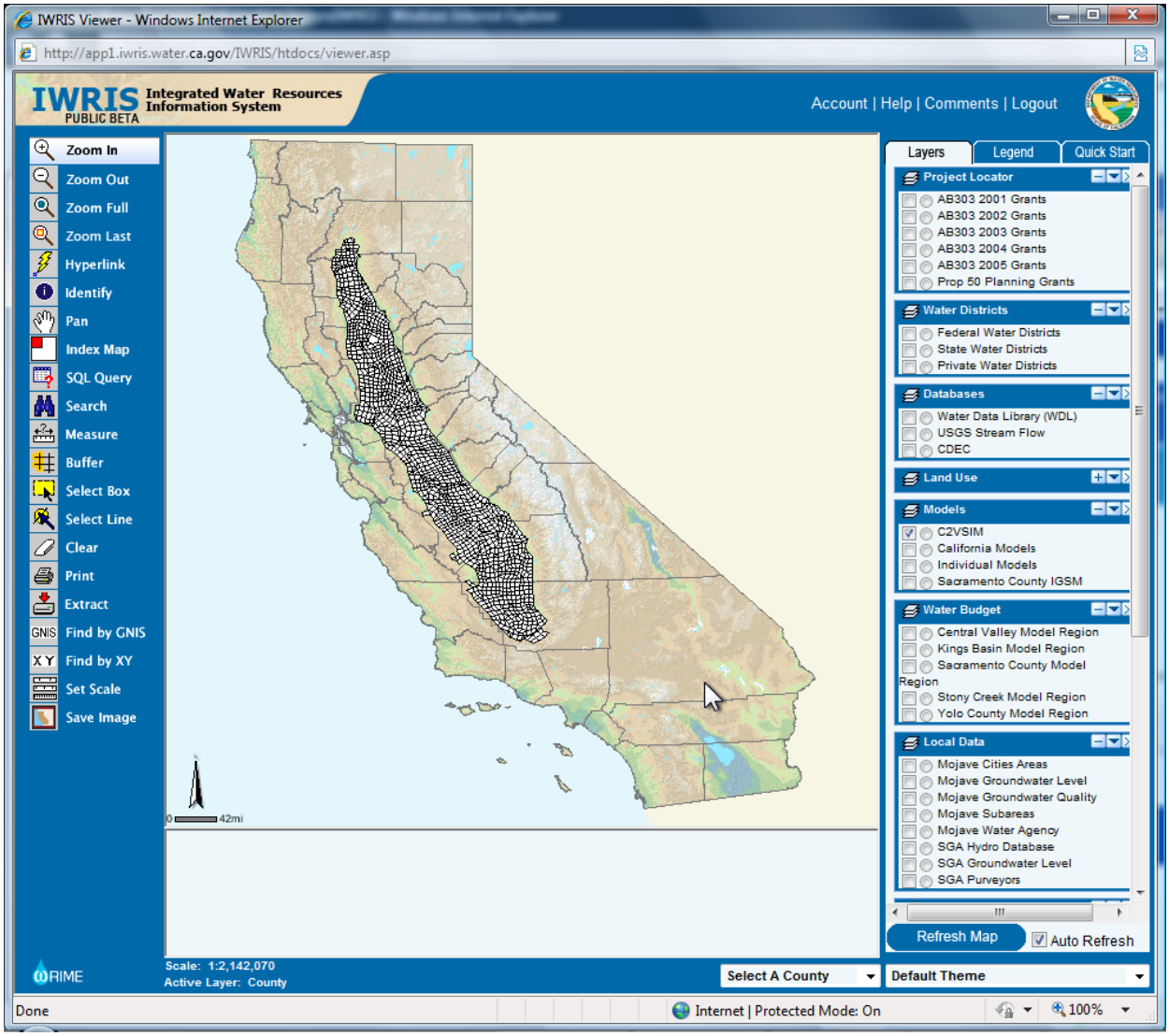

Figure 6. This snapshot of available flood models shows that various models cover the Central Valley (gridded area) but not the rest of the state (California Department of Water Resources, 2010a).

We added the 500-year dFIRM floodplains in HUC6 watersheds to those areas with approximately 500-year runoff, producing the flooding map shown in figure 8. This and other Google Earth maps were made available for interactive inspection by project participants. FEMA and USGS personnel reviewed the resulting map and found it to be realistic.

Other experts disagree with the flooding map we generated, one particularly with regard to flooding in Sacramento, another with regard to flooding in the California Delta. We found their concerns to be valid, especially with regard to the need for more thorough hydrologic and hydraulic analyses, though as discussed earlier such analyses were not practical for this study. However, after considering the particulars of their concerns, which are not detailed here, we judged their concerns valid but not compelling enough to invalidate the ARkStorm flood map that we had previously generated.

After the areas of inundation were decided upon, the flooding panel applied its knowledge of the local hydrology and hydraulics to estimate, for each HUC6 watershed, peak depth and duration of flooding (fig. 7). The panelists split two watersheds (Lower Sacramento and San Joaquin) into 3 smaller zones each, and estimated depth and duration for each of the 6 zones. Flood extents, depths, and durations were documented in ARCGIS and Google Earth KMZ files and other media, and used in later discussions and analyses

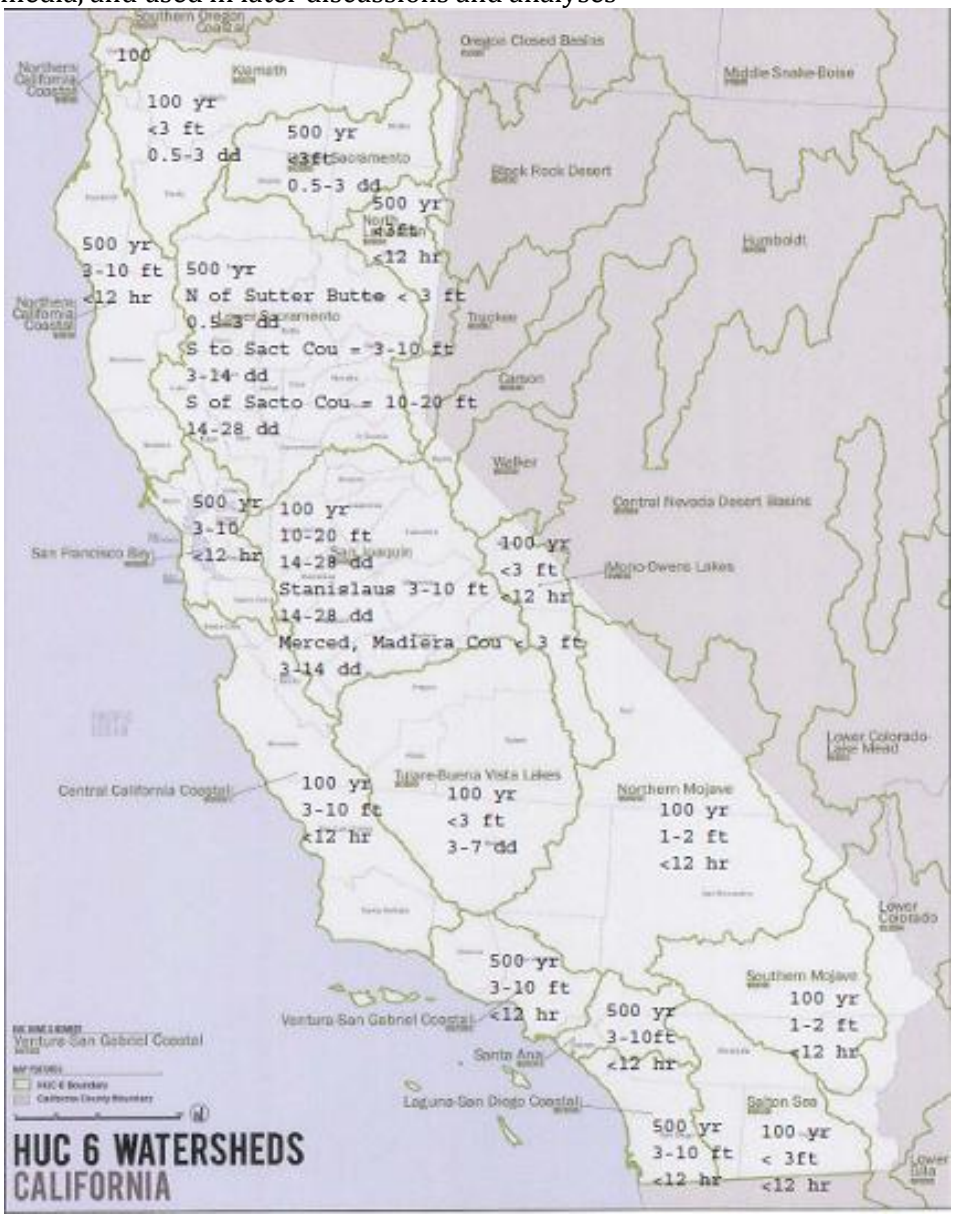

Figure 7. Hydrologic Unit Code 6 watershed boundaries, with ARkStorm flooding parameter values, depth of flooding and length of time flooded.

Figure 8. Blue areas indicate ARkStorm flooding as projected by models used in the scenario.

WINDSPEED

The windspeed time series generated by using the Weather Research and Forecasting (WRF) model were processed as follows. The time series contain the 30-second average windspeed at the beginning of each hour, at 10-meter elevation, at each of 59,580 grid points, over a 9-day period. For each grid point, the maximum value of the hourly samples is interpreted as the maximum 30-second gust velocity at that site. (The calculated maximum probably occurred during the hour.) Most structures tend to be sensitive to shorter-duration and more-intense gusts, therefore, we multiplied the maximum 30-second gust velocity by the ratio of 3-second gusts to 30-

second gusts, based on the work of Vickery and Skerlj (2005, fig 2). This ratio is approximately 1.18. The results were converted into Google Earth (KMZ) files as shown in figure 9. The figure shows peak gusts of 50 mph throughout much of the state, reaching as high 125 mph in mountainous regions.

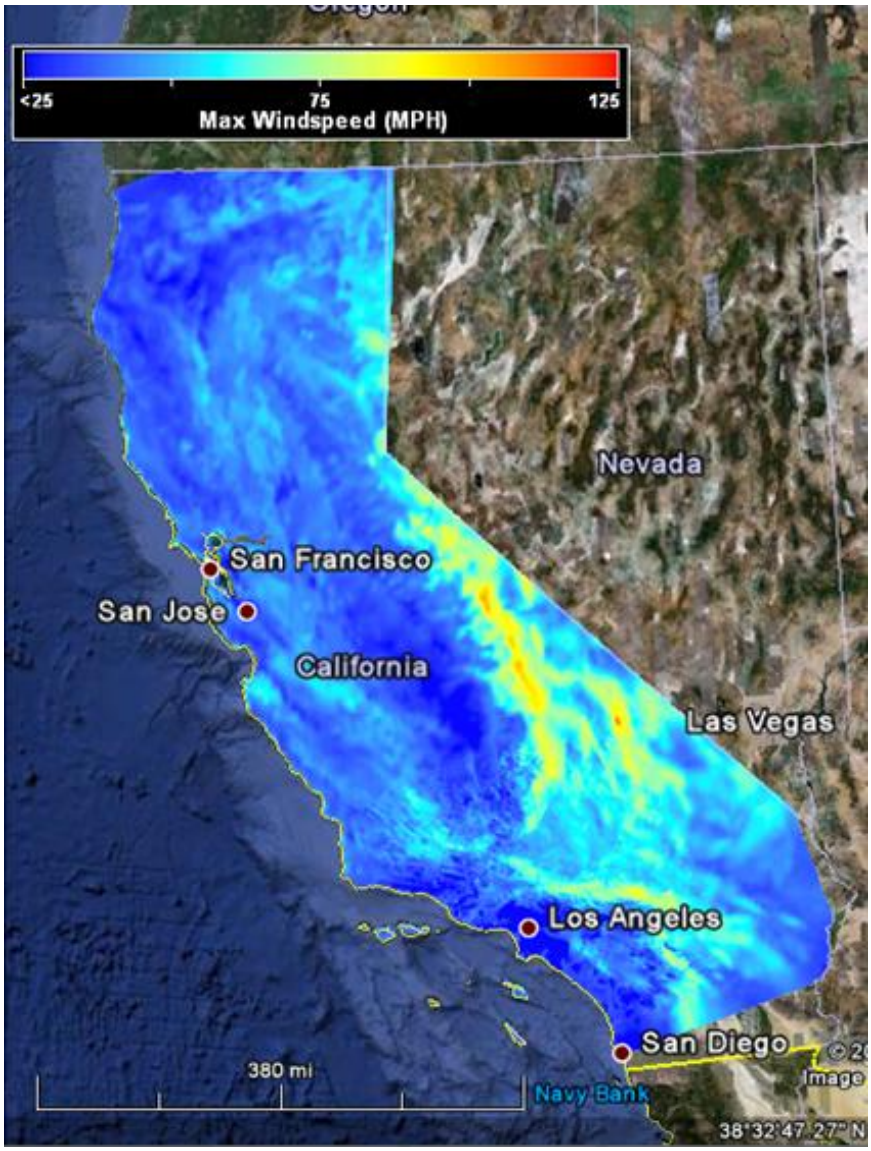

Figure 9. ARkStorm peak 10-meter elevation, 3-second gust wind speeds.

Coastal Inundation

The time-series of sea surface pressure, wind speed, and wind direction generated by the ARkStorm meteorological model provided boundary conditions for a complex, process-based numerical modeling system for simulating the impact to the Southern California coast, stretching 473 km from the Mexican border to Point Conception (fig. 10; KMZ project file available on request). The objective was to use a physics-based approach to identify the location and magnitude of the potential coastal hazards during the simulated storm. The Coastal Storm Modeling System (CoSMoS) was developed for the ARkStorm to incorporate atmospheric information (that is, wind

and pressure fields) with a suite of state-of-the-art physical process models (that is, tide, surge, and wave) to enable detailed prediction of currents, wave height, wave runup, and total water levels for mapping the distribution of coastal flooding, inundation, erosion, and cliff failure. The Google Earth-based product output of CoSMoS is designed to provide emergency planners and coastal managers with critical information to increase public safety and mitigate damage associated with powerful coastal storms. Further details of the CoSMoS framework can be found in Barnard and others (2009). The Digital Elevation Model (DEM) serving as the morphological boundary condition is described in Barnard and others (2009).

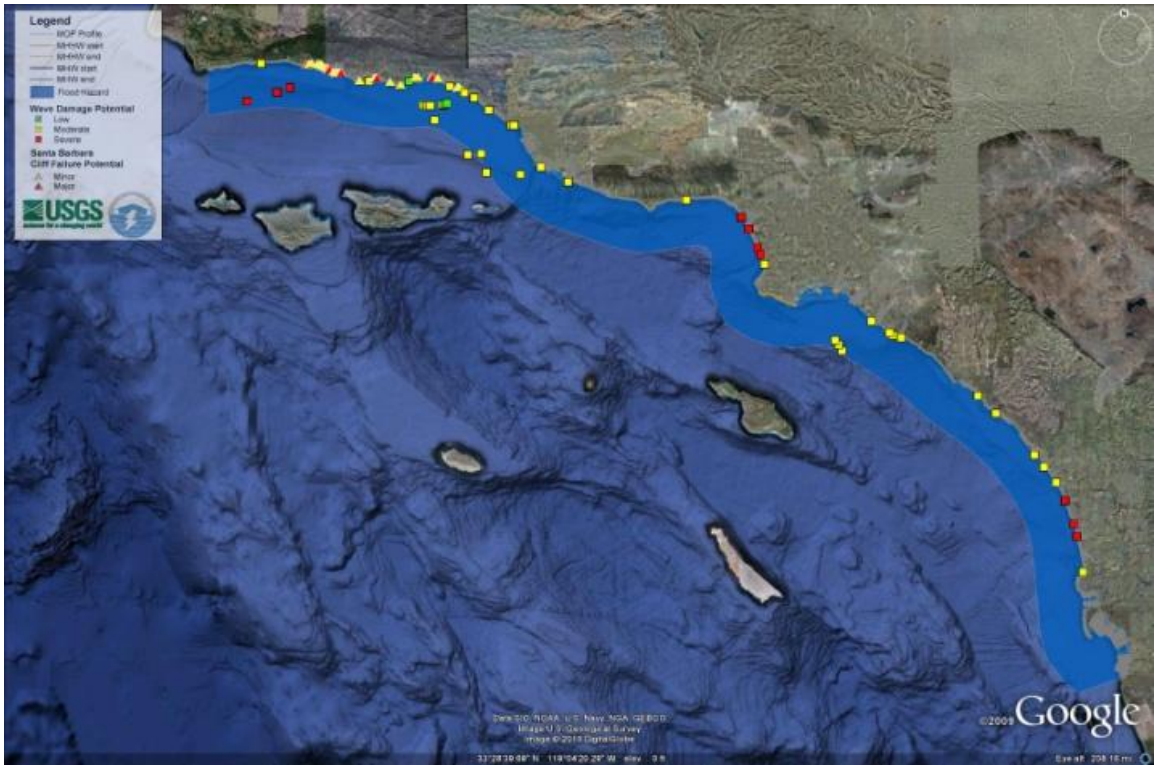

Figure 10. Extent of the CoSMoS model applied to the ARkStorm scenario. See Barnard and others (2009) for details and additional maps.

Findings. Figure 10 highlights locations of moderate and high wave damage potential (yellow and red squares, respectively) and moderate and high cliff failure potential (yellow and red triangles). The summary map shows that severe wave damage potential is predicted on the mostly west-facing beaches in Los Angeles and northern San Diego Counties, and the oil platforms in the western part of the Santa Barbara Channel. The coastal infrastructure that appears most at risk of severe wave damage includes the Manhattan, Hermosa, Venice and Imperial Beach piers, as well as coastal structures (for example, groins, jetties, seawalls) in the Los Angeles International Airport (LAX) region, and along Highway 1 in northern San Diego County. Sewage infrastructure near LAX (for example, Hyperion Treatment Plant) also appears vulnerable. Coastal flooding, resulting from the combined factors of tidal elevation, storm surge, and wave set-up, is most extensive and potentially damaging for southern Oxnard and Mugu Naval Air Station, Marina Del Rey, the Ports of Los Angeles and Long Beach (fig. 11), Seal Beach (fig.12), Del Mar (note: race track flooding), Mission Bay (fig.13) and Coronado and Imperial Beaches (fig. 14). Drastic shoreline change (beach erosion) induced by the ARkStorm conditions could lead to significant damage to public and private infrastructure, including the following regions: Imperial Beach, La Jolla, Del Mar, Solana Beach,

Carlsbad, Malibu, Santa Clara River mouth (for example, McGrath State Park), Rincon Parkway, Carpinteria, and Isla Vista (for example, University of California at Santa Barbara). The cliff failure pilot project in Santa Barbara only identifies a few sites with major cliff failure potential, but one of those sites is immediately adjacent to the Summerland Water Treatment Facility.

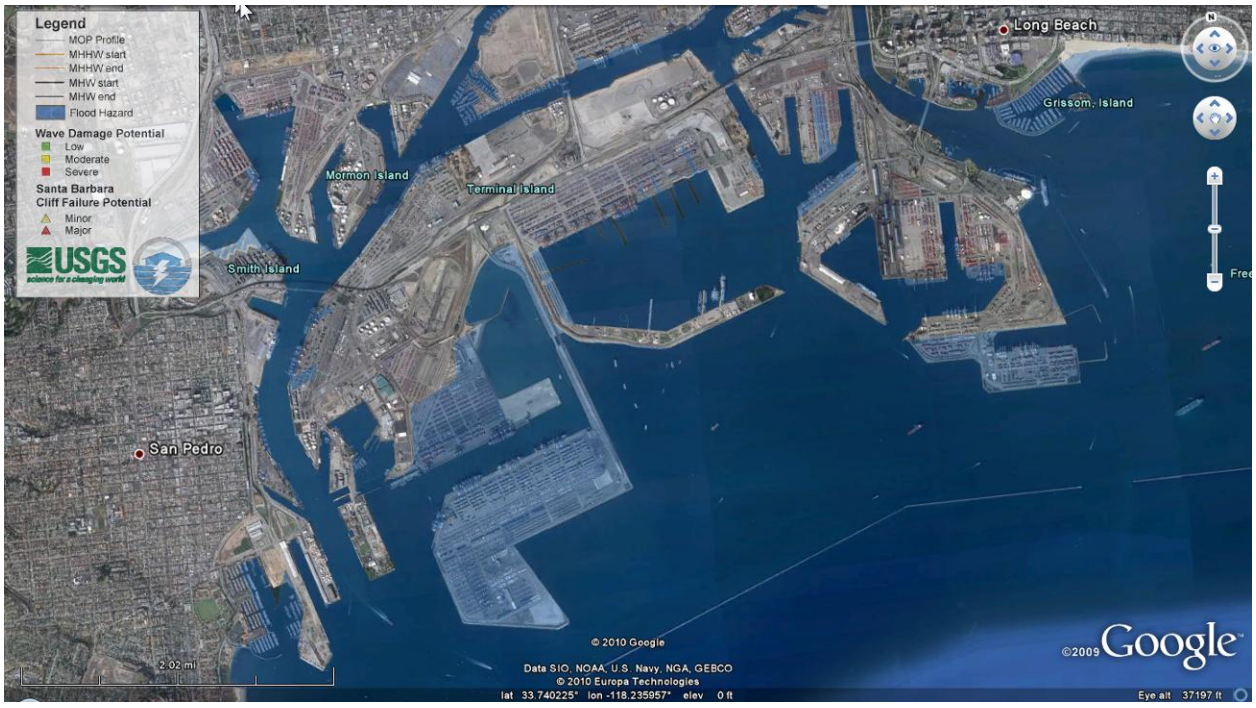

Figure 11. CoSMoS-estimated coastal inundation at the Ports of Los Angeles and Long Beach.

Figure 12. CoSMoS-estimated coastal inundation at Seal Beach.

Figure 13. CoSMoS-estimated coastal inundation at Mission Bay, San Diego.

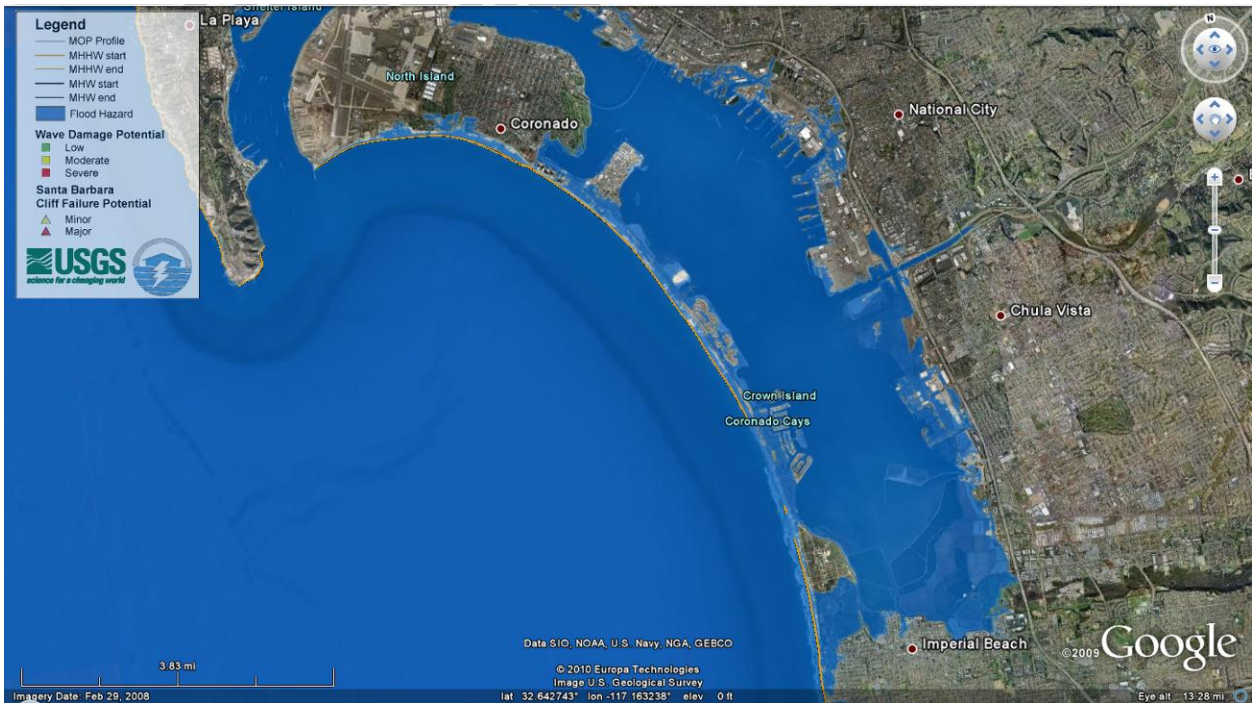

Figure 14. CoSMoS-estimated coastal inundation at Coronado and Imperial Beaches.

RESEARCH NEEDS RELATED TO COASTAL INUNDATION

Elevation data. The model relies on high-resolution, coastal elevation data (LIDAR and multibeam bathymetry). The available data could be brought up to date and expanded to cover a greater area.

Model development. We believe it would be beneficial to test and validate physical process models for the U.S. West Coast. It would also be beneficial to develop integrated modeling systems for easily assimilating atmospheric forcing data.

Landsliding

Landslides in California, triggered by historic storms, have caused hundreds of millions of dollars in damage and numerous casualties. Buildings, roads, pipelines, and other structures have been damaged by being entrained in, deformed by or as a result of the inertial impact of material flowing or sliding downslope. Landslides can be classified by the type of earth material moving and by the mode of movement (Cruden and Varnes 1996). For the ARkStorm scenario, we focus on two general modes of landsliding: (1) Large, deep-seated, slow-moving landslides usually classified as either rock slides or earth flows; and (2) Small, shallower, fast-moving landslides, usually classified as debris slides or debris flows. Figures 15 and 16 illustrate these end-member divisions of landslides. The simple division of landslides into two end member types also can be applied to landslide damage and risk, because large, slow, deep-seated landslide cause damage to structures and infrastructure while small, shallow, fast-moving landslides often threaten lives.

To characterize the potential for landslides in the ARkStorm scenario, we developed two maps of landslide susceptibility for California, one for deep-seated landslides and the other for shallow slides. We evaluated susceptibility to larger, deep landslides by combining estimates of rock strength with slope. Hundreds of mapped geologic units from numerous sources were generalized into three rock strength classes according to the approach presented by Wieczorek and others (1985). Three rock strength units, which we call hard rock, weak rock, and soil, are combined with slope to derive 10 landslide susceptibility classes following the procedures developed by Ponti and others (2008) for the ShakeOut earthquake scenario. Locations where past landslides have occurred are assigned the lowest value of rock strength. The resulting map of susceptibility to deep-seated landslides (fig. 17) shows those areas most likely to experience deep-seated landslide damage in the ARkStorm.

There are no established techniques to estimate the number of shallow landslides a storm will trigger across broad regions. Shallow landslides tend to occur during the most intense rainfalls of the storm in steep convergent areas, and involve failure of the soil and weathered bedrock layers. A fraction of these failures mobilize as debris flows, mixtures of soil, water, and rock, that sweep down steep valleys at high velocities and destroy homes and infrastructure with little warning. Historical accounts indicate that storms with more intense, longer lasting rainfalls trigger more shallow landslides. Shallow landslide susceptibility models, however, vastly overpredict the number of failures actually triggered by historic storms, and do not allow us to forecast the number of shallow landslides for a given storm. To evaluate susceptibility to shallow landsliding for the ARkStorm simulation, shallow landslide abundance was assumed to increase with rainfall intensity, duration, and number of unstable model cells in topographically-based landslide susceptibility models. Rainfall intensity and duration were calculated from hourly rainfall records, and the shallow landslide susceptibility model SHALSTAB (Dietrich and others, 1995; Dietrich and Montgomery, 1998; Dietrich and others, 2001) was used to estimate the number of unstable cells in

a 10-m DEM. Digital maps of historic shallow landslides in southern California (Santa Paula and Sunland quadrangles) and northern California (Montara Mountain Quadrangle) were used to locate landslide initiation points, and to calculate the fraction of unstable cells that actually failed for a given rainfall metric. Landslide abundance for southern California sites was found to increase as a power law function of 6-hour rainfall intensity. The hourly rainfall data from the ARkStorm simulation was then used to calculate the maximum 6-hour rainfall intensities across the Southern California landscape, which was then used to estimate the abundance of shallow landslides that would likely be generated by the ARkStorm simulation (fig. 18).

Landslides on hill slopes damage buildings and other structures on those slopes, and in some circumstances can cause significant damage beyond the hills. Alluvial fans, which underlie many urban and suburban areas of California, are built up by repeated deposits transported from the mountains in floods. A significant part of those deposits may be the result of debris flows. Projecting the run-out areas that could be impacted by debris flows is a developing science. Scientists with the California Geological Survey are preparing maps showing areas where relatively recent alluvial fan deposits are found, and so could be subject to alluvial fan flooding. This includes debris flows and more conventional flood flows and gives a maximum extent of the potential hazard. The USGS has developed another approach to estimate the volume of material that could be mobilized as debris flows in rainfall following a fire and how far material could flow down channels. This approach gives a much more detailed look at a specific aspect of the debris flow hazard, but is unavailable to model debris flows over an area of the size that could be impacted by the ARkStorm. Although we have not attempted to estimate the amount of damage that could result from debris flow runout and alluvial fan flooding, the evaluations prepared for the ARkStorm scenario show the areas potentially impacted by this hazard.

Having established statewide susceptibility maps for deep-seated and shallow landslides, this study considered the risk these potential landslides pose to the constructed environment. However, landslide damage cost information is very limited, and this part of the ARkStorm evaluation was projected from a few small datasets. The most detailed and complete available data on landslide damage to buildings was gathered by the City of Los Angeles following the 1978 storms. The damage cost reported in that dataset is estimated for each locality, and the type of landslide involved is described. This dataset shows the majority of the building damage from “surface slump” or “rotation,” with a relatively small fraction due to “mudflow.” Though limited, these data were extrapolated to the rest of the state and compared with susceptibility maps for deep-seated landslides.

The susceptibility map for deep-seated landslides was generalized to give a single value of susceptibility for each census tract. A “loss ratio” was calculated for each census track as the cost of landslide damage from the 1978 storms divided by the value of light wood frame structures within the census tract. Using the median susceptibility for each census tract provides three general categories of damage:(1) tracts with a median susceptibility of 0 to 3 have no landslide damage, (2) tracts with median susceptibility of 5 or 6 have loss ratios of about 0.016 percent, (3) and tracts with median susceptibility of 7 or above have loss ratios of 0.096 percent. The susceptibility map was converted to a landslide loss ratio map by using these values, (fig. 19). These loss ratios are for the average storm intensity and landslide vulnerability of Los Angeles in 1978; projected statewide. Generalization to other storm intensities is possible by using data from the San Francisco Bay Area. Damage from the 1982 storm in Santa Cruz County was over 3 times our loss ratio projection from the 1978 data, while damage in Sonoma County was only 5 percent of our projection. This probably reflects regional variation in the intensity of the 1982 storm, which had a recurrence interval of over 100 years in Santa Cruz, but only about 10 years in Sonoma County. Using this tentative

relationship, the ARkStorm is estimated to cause at least three times our projections of building damage from the 1978 data, similar to the relatively rare, very intense 1982 storm in Santa Cruz County.

Data on landslide damage to roads, pipelines, and other infrastructure is similarly sparse and inconsistent. The relatively complete records kept by California Department of Transportation (Caltrans) over the past decade give some perspective on the cost of landslides to roads. Based on records of "emergency opening" costs, Caltrans spends $20-40 million on landslide repairs in a typical year. In wet years the cost jumps to about $150 million. Projecting from these data to the amount of rainfall in the ARkStorm suggests costs of about $300 million. In addition to "emergency opening," Caltrans plans and budgets for long-term landslide repair projects. The average cost of these projects over the past decade has been about equal to the cost of "emergency opening". Landslide damage to local roads, pipelines, electric transmission lines and other infrastructure has been greater than the damage to state highways in past storms (Crovelli and Coe, 2009).

Despite the major data gaps and the broad generalizations that resulted, our best estimate is that the ARkStorm could cause tens of thousands of landslides, the vast majority of them debris flows, and cost on the order of $3 billion. This estimate includes about $1 billion in damage to private property, $1 billion to state highways, and $1 billion to other infrastructure. Costs because of debris flow runout, which cannot be estimated at this time, and indirect costs because of disruption of infrastructure and other indirect damage will multiply these direct losses.

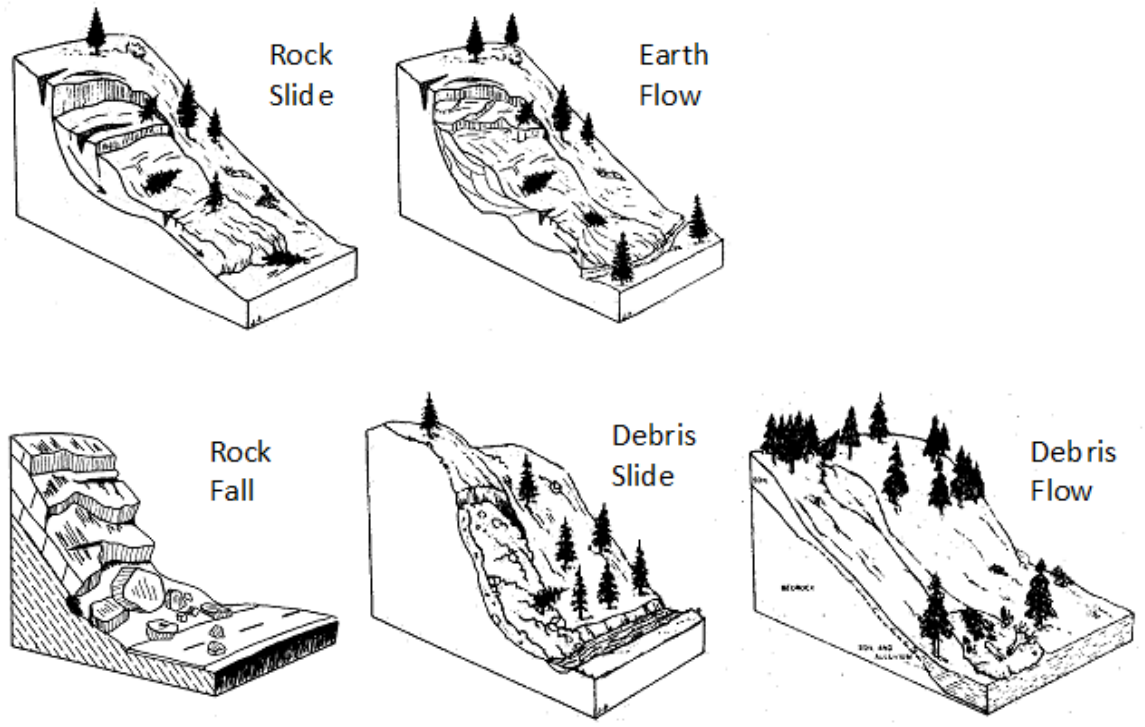

Figure 15. Categories of landslide treated by ARkStorm (Wills and others, 2001 modified after Varnes, 1958 and Colorado Geological Survey, 1988)

Figure 16. Deep-seated landslide in Ventura Calif., January 2005 (left, photo credit: J. Stock, USGS), and 1982 debris flow in Pacifica, Calif., that killed 3 (right, photo courtesy of Woodward Clyde Consultants).

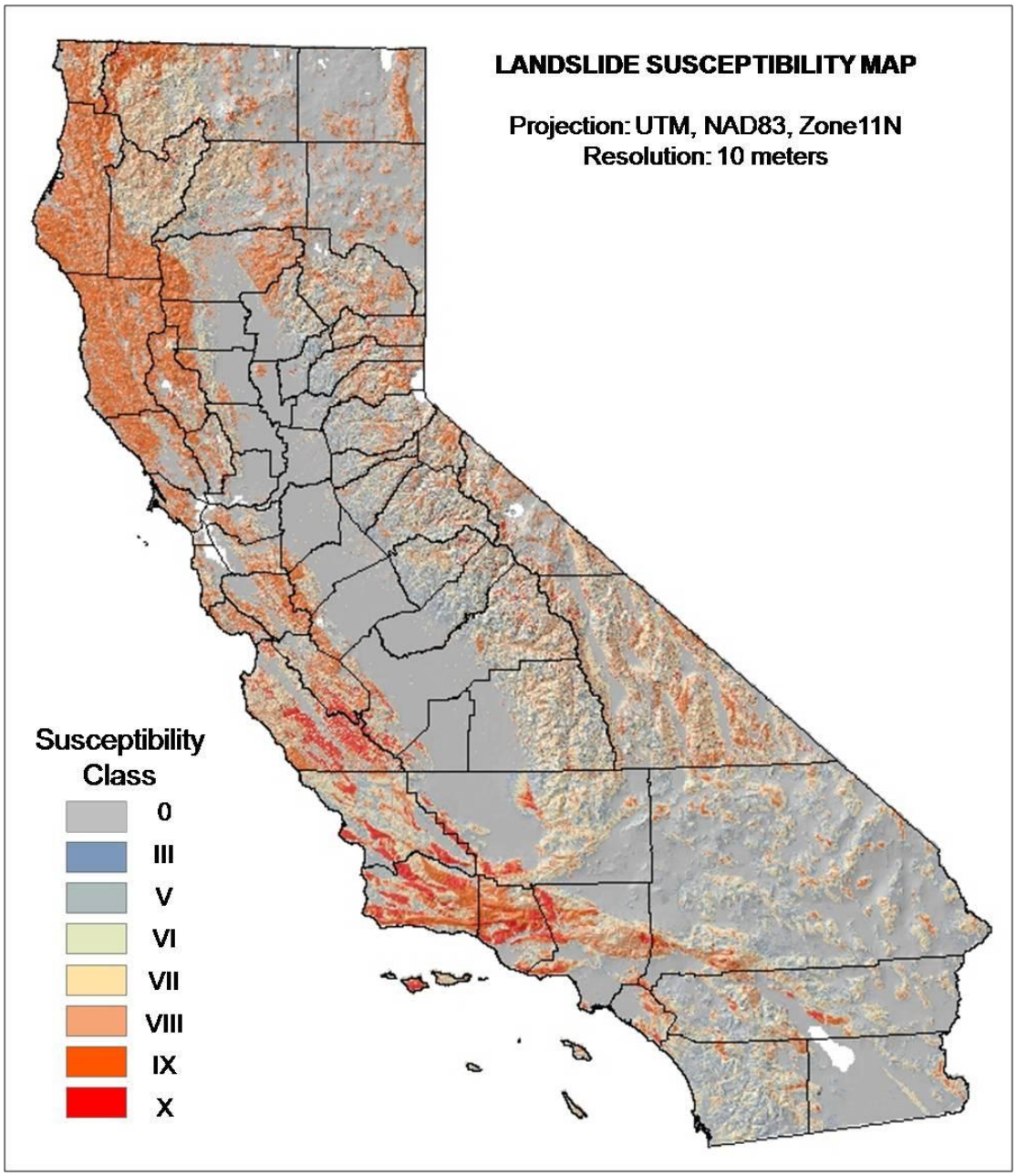

Figure 17. Deep-seated Landslide Susceptibility Map of California. Black lines denote county boundaries. Higher numbers and hotter colors indicate greater susceptibility to deep-seated landslides.

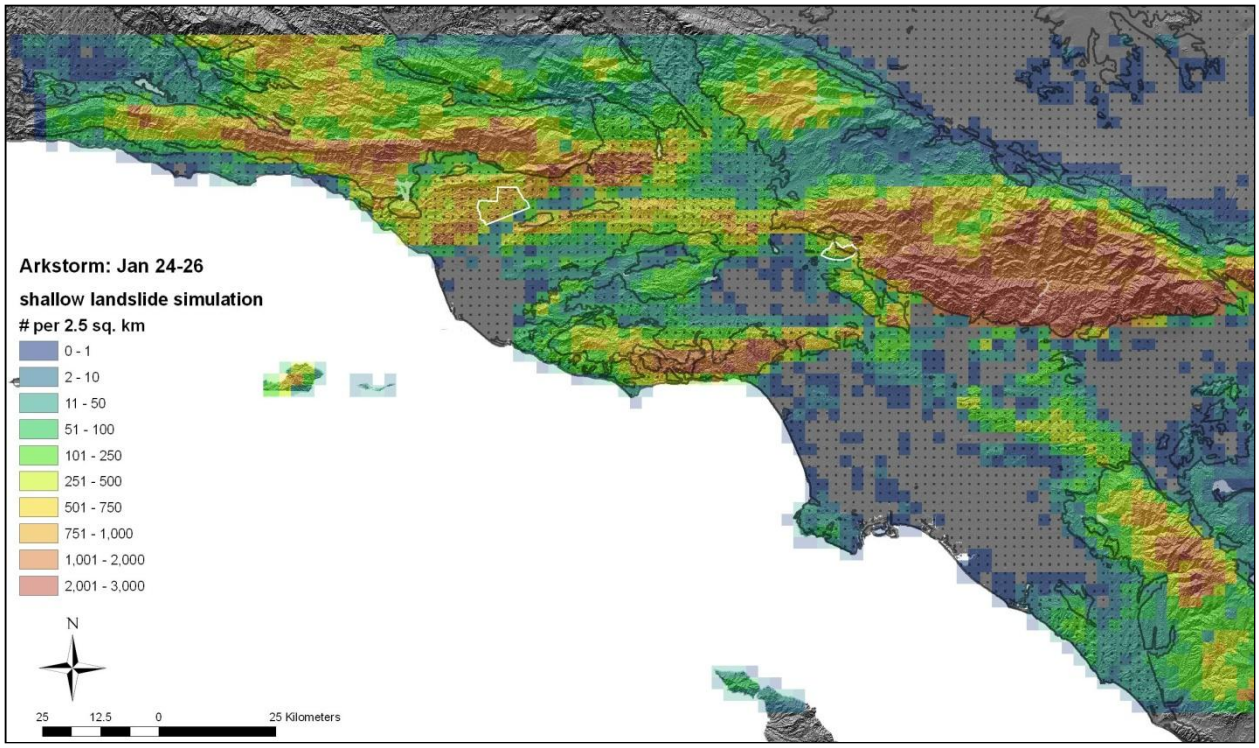

Figure 18. Quaternary, Pliocene, and Miocene sedimentary rocks (hachured area) superimposed on the forecast for landslide abundance resulting from the ARkStorm. Cells in the hachured area have rock types similar to the calibration area at Santa Paula. Cells outside these zones likely overestimate the number of landslides because (1) rock units produce stronger soils and (2) different processes (for example, rock fall) dominate erosion. Gray areas have no unstable cells in 10-meter data. Calibration (Santa Paula) and test (Sunland) areas shown by white polygons.

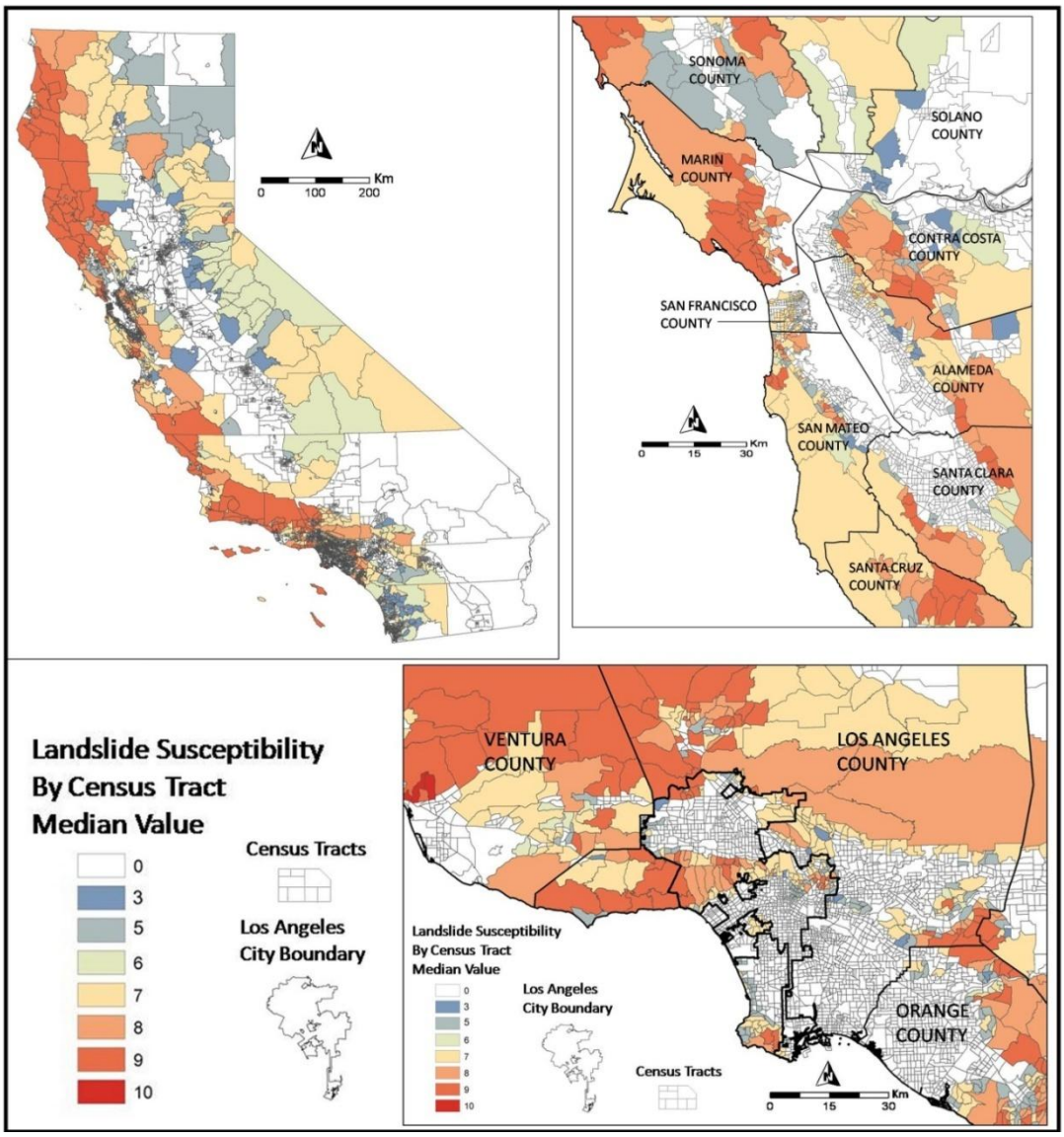

Figure 19. Deep-seated Landslide susceptibility expressed as the median value for each census tract, which can be related to loss ratio for that tract.

RESEARCH NEEDS RELATED TO LANDSLIDING

Our ability to understand and model landsliding and its consequences would benefit from:

- Accurate digital mapping of historic landslides;
- Accurate digital mapping of historic and pre-historic storm damage; and
- Methods for estimating damage from debris-flow runout and alluvial fan flooding.

Three Approaches to Estimating Damage

To help inform our damage estimates, we compiled an extensive database of historic storm impacts in California, including summaries of news reports and newspaper images from 1861-1862, 1938, 1969, 1986, and 1997. Many of these reports and images were geolocated and placed in Google Earth files for interactive examination. The database is too extensive to copy in this report; the database was made available for examination by ARkStorm panelists and scenario developers.

We estimated physical damages in the ARkStorm scenario by three different approaches. To produce a realistic outcome at the aggregate societal level, we employed the data and methods of the FEMA flagship emergency-planning software HAZUS-MH. To examine the effects of the ARkStorm on lifelines such as the highway network, power, and water, a series of 12 panel discussions were held with engineers, operators, and emergency planners from the various lifelines at risk. The panel participants were presented with the meteorological and flooding inputs, and offered their judgments about the resulting damage and restoration efforts that they would undertake if ARkStorm really occurred. Finally, three studies were performed by individual experts on topics requiring highly specialized knowledge: demand surge, telecommunications, and insurance.

To be clear: we did not apply all three approaches to each type of asset at risk. Only one approach was used for each particular kind of asset: lifelines damage was estimated based only on the expert opinion of the lifeline operators themselves, building damage was estimated by using only the HAZUS flood methodology, and three consultant reports were commissioned on specific topics. We begin by presenting lifeline panel findings, then present HAZUS-based property loss estimates, and conclude with the special studies.

Lifeline Panel Process

In January and February 2010, scientists and engineers developing the ARkStorm scenario convened 12 half-day meetings in Pasadena, Sacramento, Menlo Park, and San Francisco with officials of 43 federal, state, local, and private agencies, utilities, and universities listed in the Acknowledgments section of this report. They were from departments of transportation, water and wastewater service providers, power utilities, public-health and public-safety agencies, and entities that own, maintain, or regulate dams and levees.

Panels were convened on four topics: roads and highways; dams and levees; power; and water and wastewater. Each topic was addressed by a different panel in each of these general locations: Pasadena (for participants based in southern California), Menlo Park and San Francisco (for the San Francisco Bay Area), and Sacramento (for Central Valley participants). We sent 229 invitations; approximately 85 people attended the panel discussions.

The purpose of the lifeline panels was fourfold: (1) to educate lifeline operators of the potential for and impacts of an event like an ARkStorm, and thus indirectly to stimulate discussion within their organization about enhancing disaster resiliency; (2) to gather panelists' expert opinion as to the physical damage of the hypothetical storm and other impacts to the facilities they operate; (3) to gather their expert opinion about the time it realistically could take to restore their facilities, considering among other things lifeline interaction; and (4) to identify important research needs highlighted by the ARkStorm.

Participants were invited by email and follow-up phone calls, generally beginning 2 to 4 weeks in advance. The invitations also included a brief abstract summarizing the ARkStorm

scenario and URL and credentials for downloading the Google Earth maps of windspeed, flooding, and historic impacts.

Each meeting generally followed the same agenda: 1.5 hours in which the ARkStorm development team summarized the material presented above, plus findings of panels that had already met, followed by 2.5 hours in which the group discussed the assets exposed to damage, the agents of damage, a realistic damage scenario, a realistic restoration scenario, and a discussion of opportunities to enhance resiliency either by strengthening facilities or by better responding to damage so as to minimize the negative impacts of damage. We made audio recordings and took notes of the discussion. After the panel meetings, we synthesized the notes and filled gaps through literature searches and additional analysis, as discussed below.

A note regarding methodology: We considered but dismissed the notion of following a formal process for eliciting expert opinion such as a Delphi Process (Dalkey and others, 1970). Considering the quantity of information we needed, such a process appeared likely to be excessively time consuming and likely to be off-putting to panelists. An important advantage of the Delphi process is that it prevents a few individuals from dominating the discussion. On the other hand, the same end can be achieved if the moderator is trained in group communication and deliberately seeks discussion from all panelists, including the quieter ones. Our less-formal approach seemed more suited to meet our objectives, particularly of stimulating discussion with panelists' organizations, although this approach may lack scientific rigor.

Highway Damage

HIGHWAY FACILITIES AND SOURCES OF DAMAGE

The state of California has more than 50,000 miles of highway and freeway lanes, managed by Caltrans. According to the National Bridge Inventory, there are more than 23,000 bridges in the state. The primary perils to highways are landslides either burying or undermining them; floods inundating them; and clogged culverts causing flooding and erosion where the water washes over the roadway and onto the soil beyond. The primary causes of bridge damage in severe winter storms are scour undermining the foundations of bridge piers or abutments and hydrodynamic pressure at the upstream edge of the bridge superstructure (the girders, driving surface, and crash barriers).

HIGHWAY DAMAGE AND RESTORATION SCENARIO

Since this slope-stability research was ongoing at the time of the panels, we applied the judgment of ARkStorm research staff and of Caltrans panel participants to select locations where landslides bury or undermine roadways, or block culverts and cause flooding and erosion. Likewise, because streamflows were not calculated at each bridge location, we applied judgment to select bridges to hypothesize as damaged by scour at the substructure or hydrodynamic pressure on the superstructure. Locations of inundation were identified by overlaying the flooding map on the roadway network. The resulting hypothetical damage is mapped in figure 20, which distinguishes highway impacts as resulting from either: (1) debris flow; (2) flooding, (3) both flooding and erosion, and (4) landsliding.

Restoration time was estimated depending on the type and extent of damage. Hypothesized duration of flooding dictates how long roads are inundated and impassible. Debris flows can be cleared relatively quickly, within hours of equipment and repair crews arriving. However, on routes with large numbers of debris flows the time to clear each flow adds up, and the importance of the route—how much traffic normally carried and the availability of alternate routes—matters greatly to how routes are prioritized for clearing. Bridges with severe foundation damage or displaced spans can take months to repair or replace. Roads over deep-seated landslides can be partially restored quickly by regrading and reducing the speed limit, but permanent repair could take months.

With these considerations in mind, the highway panels estimated the number of days required restore each route to 25 percent, 75 percent and 90 percent capacity, beginning after the peak of each storm, that is, January 27, 2011, in southern California, and February 9, 2011, in northern California. For present purposes, southern California comprises counties including and south of Santa Barbara, Ventura, Los Angeles, and San Bernardino. Northern California comprises all the counties north of these counties.

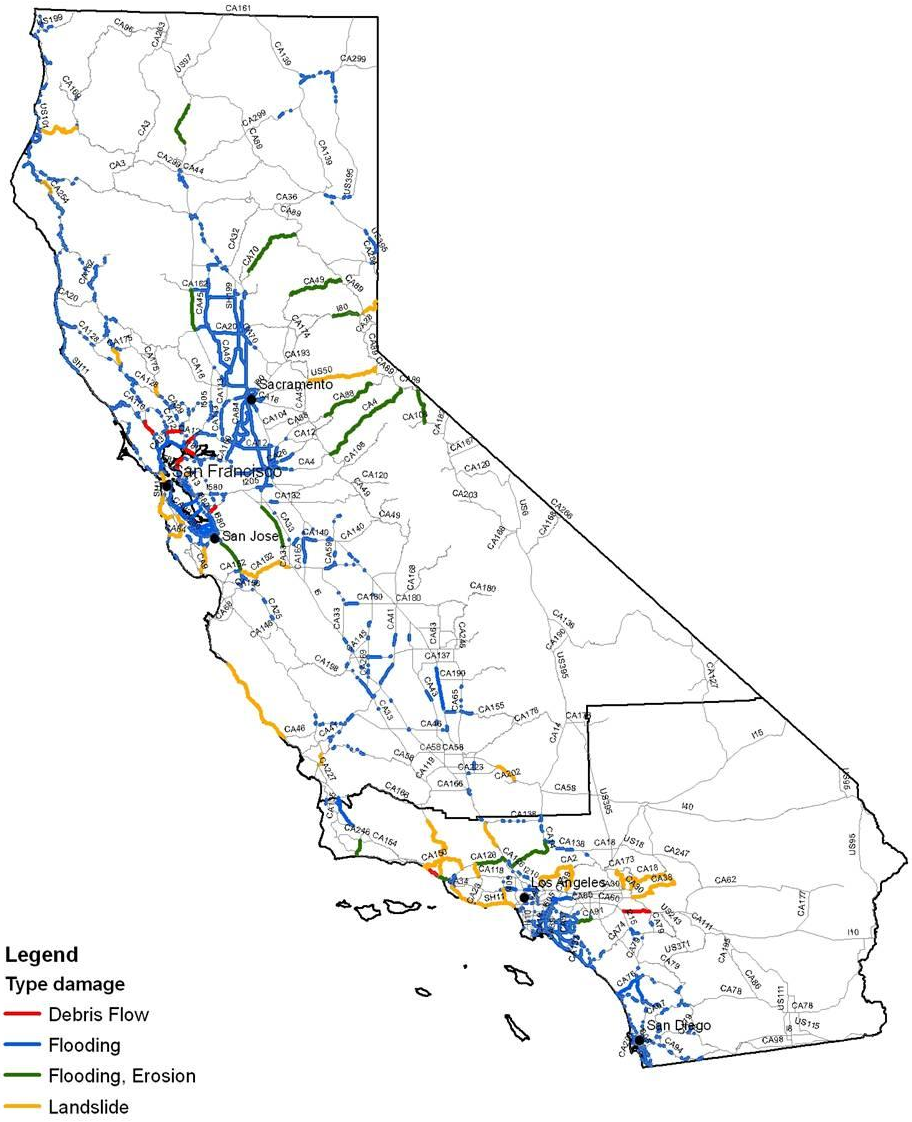

Figure 20. Causes of ARkStorm cumulative highway damages. Red indicates debris flow, blue indicates flooding, green indicates flooding and erosion, yellow indicates landslide other than debris flow.

To present route capacity at arbitrary points of time, we fit smooth curves to the 3 assigned capacity points (25 percent, 75 percent, and 90 percent), on a route-by-route basis. For example, we found values a and b to most closely fit a curve of the form y = aln(x) + b where y is highway route capacity as a fraction of full capacity, x is time in days after the storm (that is, after January 27 or February 9, in southern and northern California, respectively), and a and b are adjustable parameters fit to the 3 restoration points. Because 25 percent capacity approximately represents opening of the first lane of a highway, any calculated capacity less than 25 percent is taken as closed, that is, 0 percent capacity. The 90 percent capacity is representative of normal conditions because highways rarely operate at 100 percent capacity. The results are shown in the following maps. Figure 21 shows route capacity 3 days after the peak of the southern California part of the

storm, on January 30, 2011. Figure 22 depicts capacity on day 14, February 10, 2011. The capacity after 30 days (February 26, 2011) is shown in figure 23. Figure 24 is capacity after 3 months; Figure 25 after 6 months; and Figure 26 is route capacity 1 year after ARkStorm, showing that some routes (especially Route 1) are still undergoing repairs because of large deep-seated landslides. A spreadsheet and GIS files of these data were made available on a password-secured website for panelists' use in interpreting and revisiting highway damages.

Note that the figures show that the storm largely cuts off traffic from Los Angeles to the north and east for 1-2 weeks, with gradual recovery. The same is true of Sacramento: traffic to the north, south, and west is largely cut off for 1 week or so, with gradual recovery thereafter.

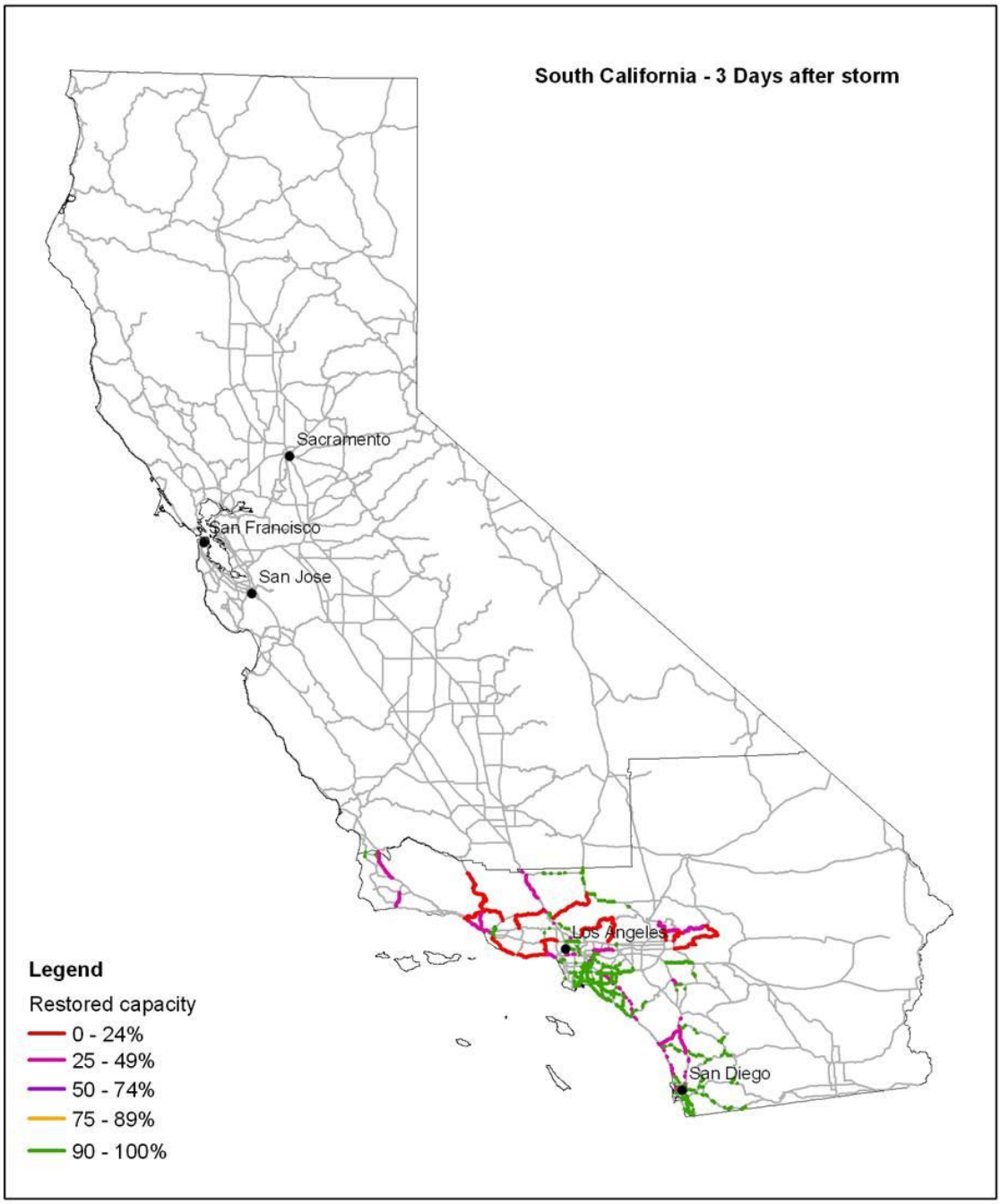

Figure 21. Highway route capacity on January 30, 2011.

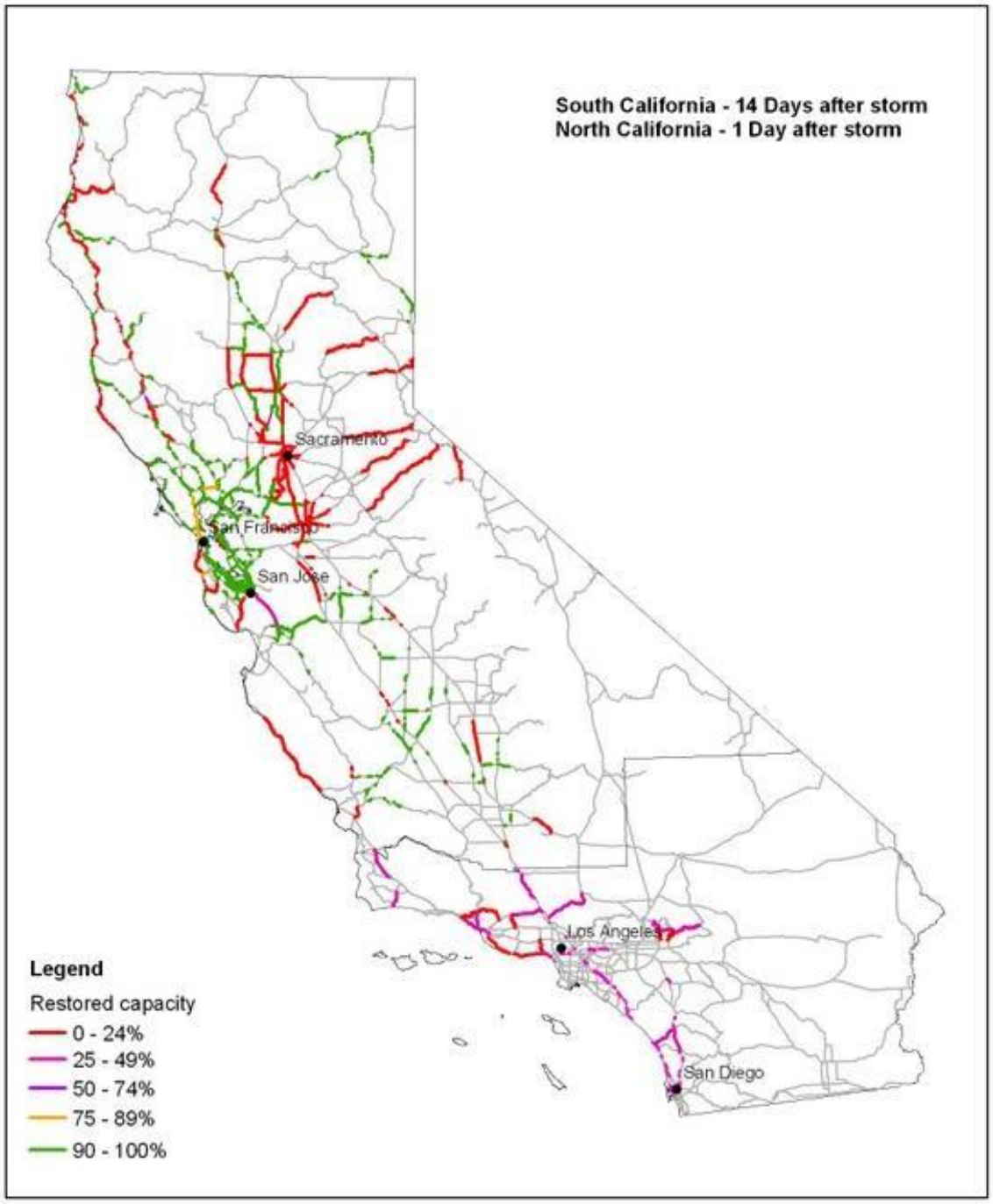

Figure 22. Route capacity on February 10, 2011.

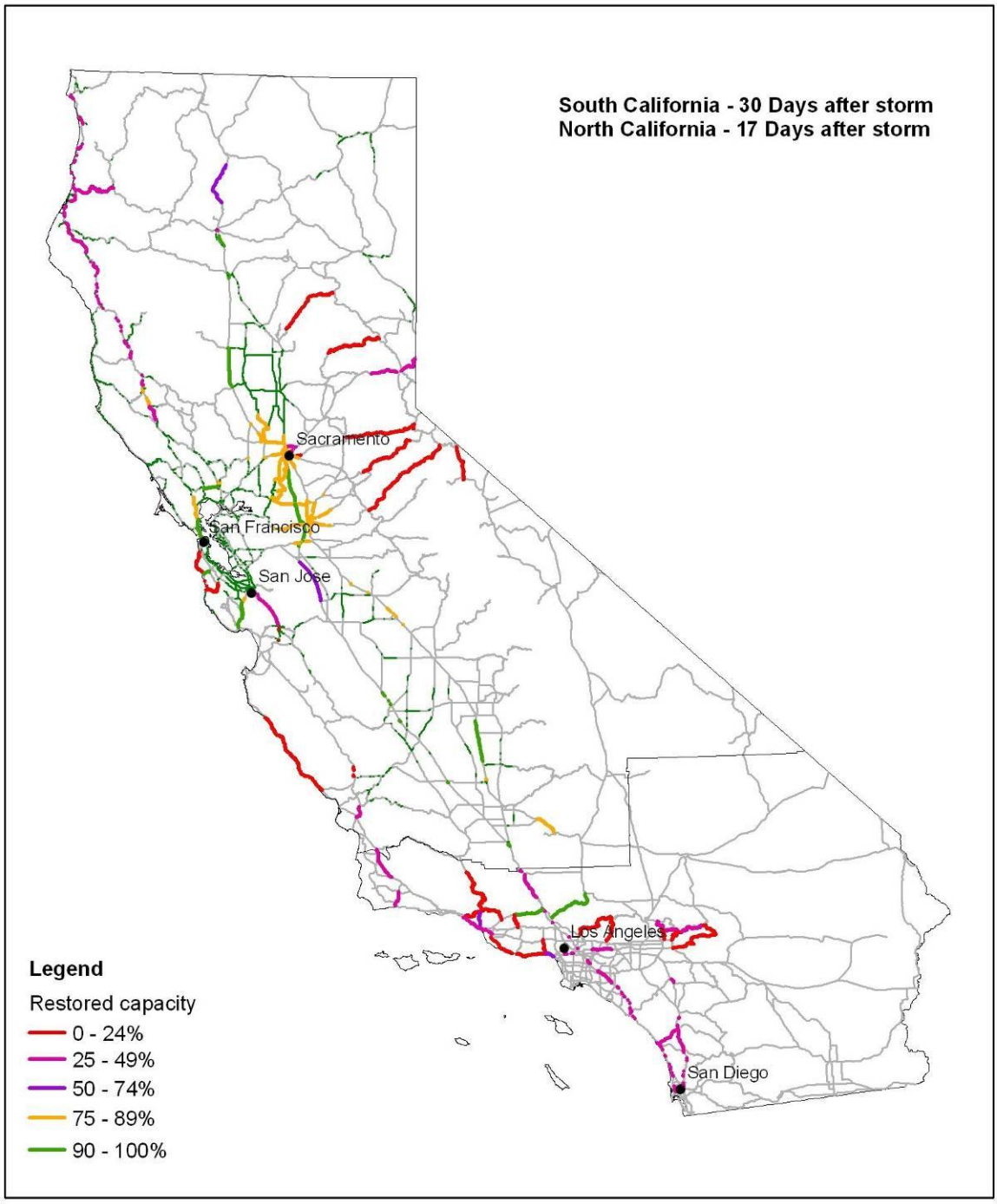

Figure 23. Route capacity on February 26, 2011.

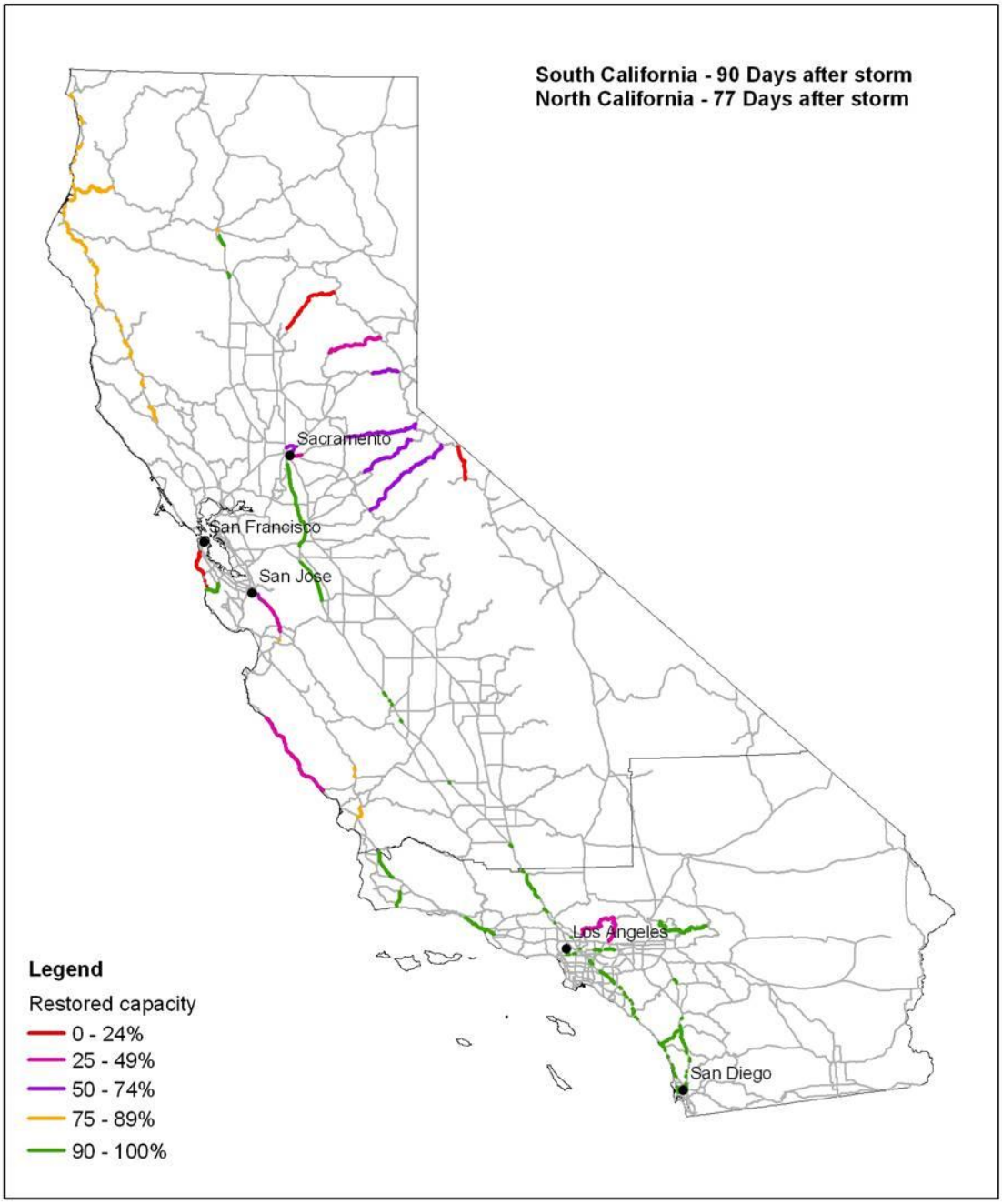

Figure 24. Route capacity on April 27, 2011.

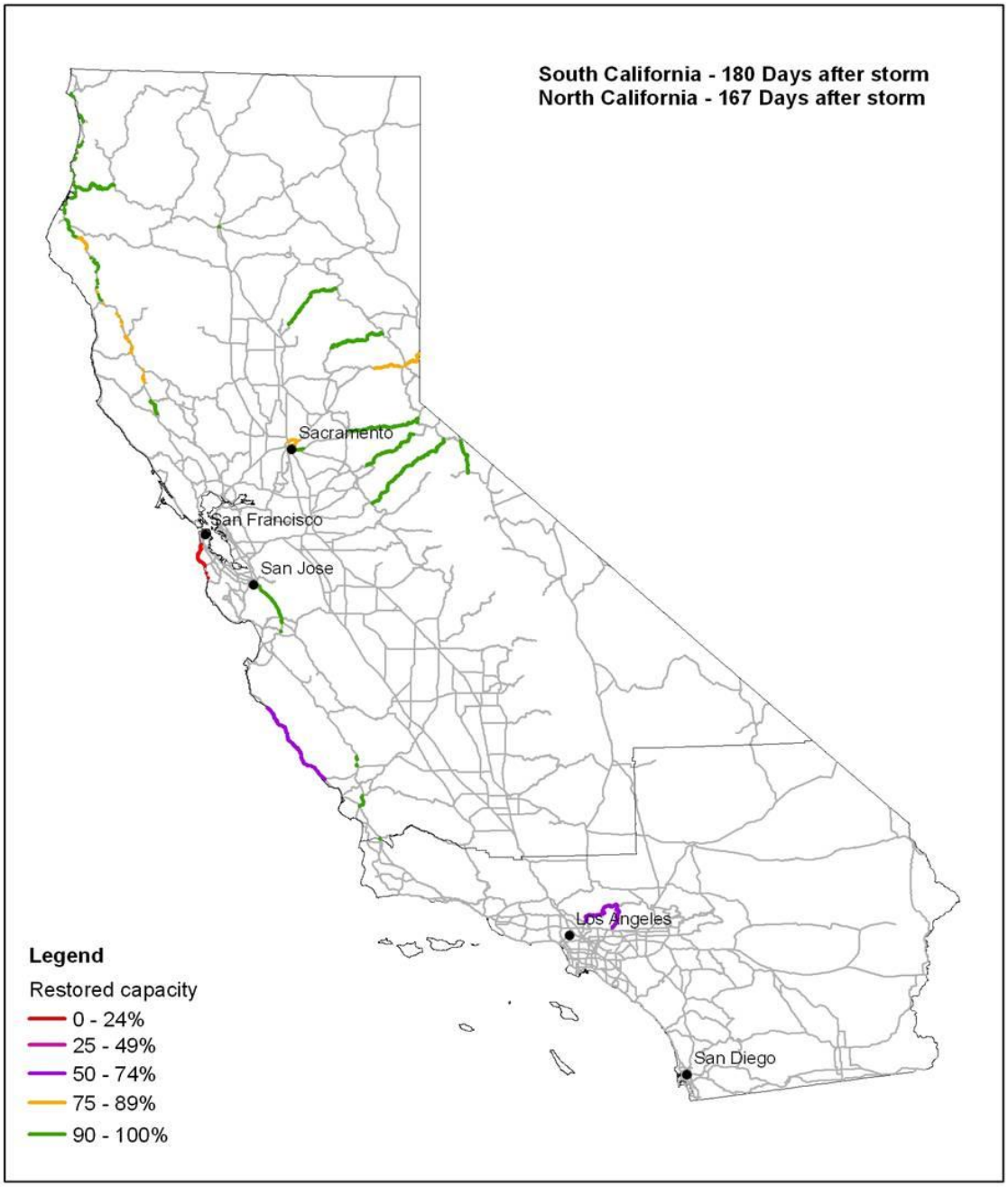

Figure 25. Route capacity on July 27, 2011.

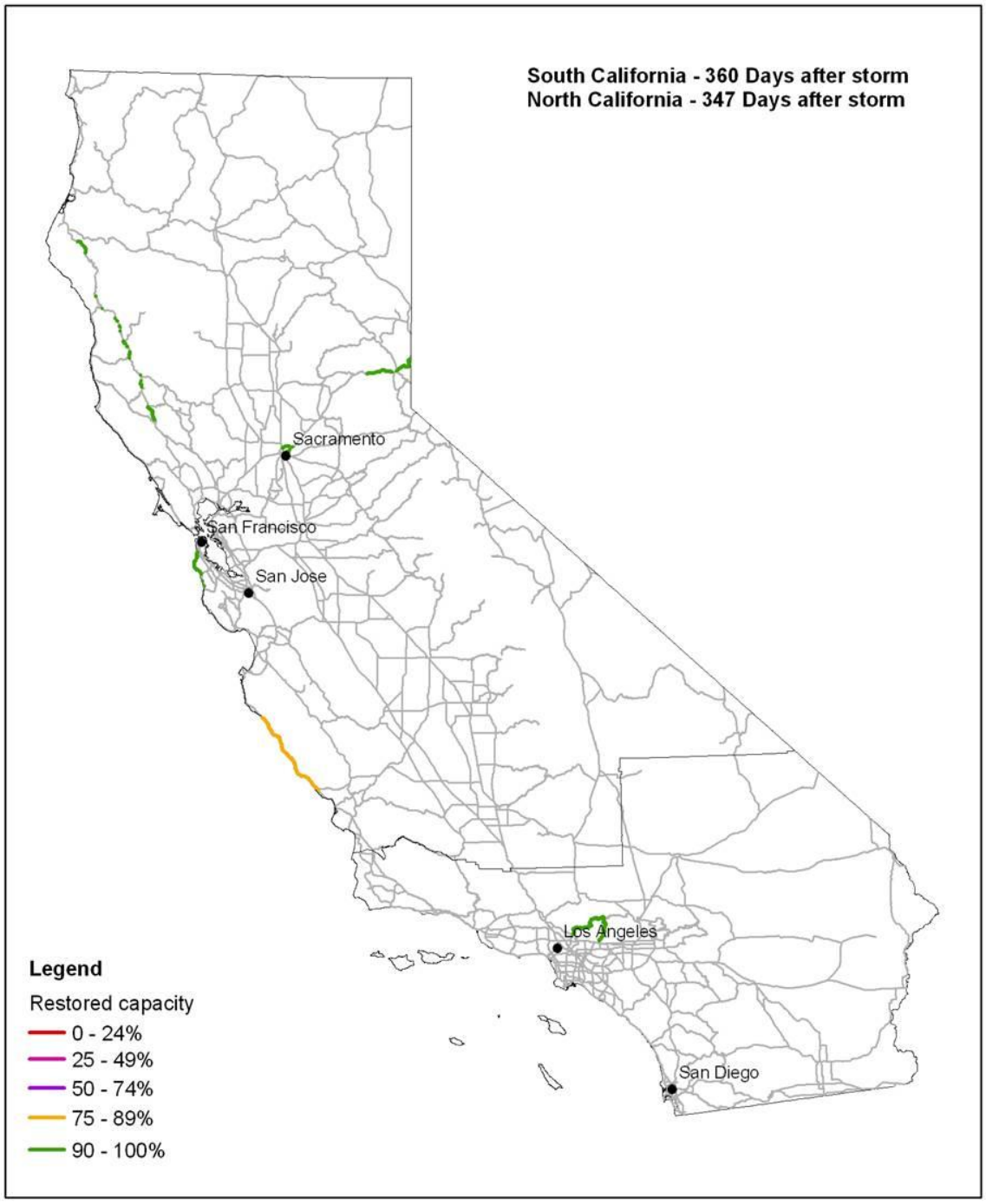

Figure 26. Route capacity on January 27, 2012.

LIFELINE INTERACTION INVOLVING HIGHWAYS

Several panels noted how restoring their facilities depend on access. A large water district noted that it has critical pipelines that run through steep terrain, vulnerable to landslide, and that access to some of these lines is limited. Highway and roadway damage from landslides and bridge

damage could hinder repairs. Wastewater treatment near Long Beach likewise is affected by access, primarily by flooding: rising water might force employees at Terminal Island to abandon the treatment plant for their own safety. Furthermore, the southern California panel discussing water and wastewater noted that a number of water-supply pipelines are carried on highway or roadway bridges, some of which are subject to scour and hydrodynamic pressure.

Water-supply and wastewater treatment panels noted that they rely on supplies of chemicals that are carried on railway and trucks every few days. In the Sacramento panels, for example, it was observed that most of the chemicals used by water and wastewater treatment facilities are carried over I-80, which would be temporarily cut off.

LIMITATIONS OF HIGHWAY RESTORATION TIMELINE

Three important limitations of this scenario were recognized during the initial panel discussions. First, these restoration times may underestimate competition for limited resources. Second, these restoration timelines were laid out without full consideration of the needs for evacuation. Third, the landslide assessment for northern California was not available at the time of the panel discussions. New landslide information might affect the assessment of both damage and restoration. Other considerations that were overlooked during the panel discussions also may affect restoration.

OPPORTUNITIES TO ENHANCE HIGHWAY RESILIENCY

In discussions with highway panelists, the following possibilities were raised as opportunities to prevent highway damage or to recover faster:

- Caltrans could purchase and stockpile Bailey bridges. Bailey bridges are portable, pre-fabricated trusses, primarily used by military engineering units to bridge up to 60-meter gaps (200 feet). These bridges do not require heavy equipment for construction; can be brought to the jobsite in trucks; and are strong enough for heavy traffic. Caltrans owns a few, probably not enough for the need suggested by ARkStorm. One panelist suggested that railroad flatcars might serve a similar purpose.
- Preplan detours to enhance redundancy more quickly.
- Prepare to move Caltrans equipment away from vulnerable areas in response to forecasts of severe weather.
- Engage the contractor community to prepare for severe storms, for example, beginning with conversations with the Association of General Contractors in preparation for Golden Guardian 2011.
- Have contracts in place for rental and repair of pumps, especially large pumps.
- Consider dense string of webcams or CCTV cameras covering the roadway network for real-time virtual inspections.
- Install strain gages and pore-water-pressure gages or other monitoring of known, deep-seated landslides.
- Construct a system for 2-way 511 information with the public. USGS is in early conceptual planning of such an application called Did You See It? The application or Caltrans would require heavy filtering to keep the labor requirements for such a system affordable.
- Plan for emergency housing of Caltrans workers and possibly their families.
- Engage FEMA to allow post-disaster repair to higher standards than original construction.
- Enhance evacuation procedures—consider benefits of earlier evacuations and of identifying evacuation centers based on weather reports.

- Characterize and communicate uncertainty for better decisions by using weather and climate forecasts.
- Enhance education and outreach—encourage people to have a family evacuation plan.
- Coordinate with construction contractors to pre-position repair equipment.
- Address growing labor limitations, for example, by partnering with cities, cross-training labor force for repairs, and identifying potential sources of repair crews. (One panelist mentioned crews from San Quentin State Prison)

Power

POWER FACILITIES AND SOURCES OF DAMAGE

The following power scenario is based on panel discussions with Southern California Edison, Los Angeles Department of Water and Power, the Sacramento Municipal Utility District, and California Utilities Emergency Association. In addition to these discussions, one of these entities, provided a detailed but confidential write-up following its internal considerations of the meteorology, flooding, windspeed, and landslide information provided to the panel. These materials are supplemented by data provided by utilities in follow-up conversations, and with data available in the Homeland Security Infrastructure Program (HSIP) Gold 2007 database, including the locations of essential facilities such as substations, power transmission routes, and wastewater treatment plants.

Note that representatives from Pacific Gas and Electric (PG&E) stated that they were unable to contribute at that time and that they would inform us later whether they would be able to participate; as of this writing they have not done so. The following, therefore, does not reflect the opinions or judgment of PG&E personnel. It does reflect our initial interpretation of the statements made during the other meetings, subsequent conversations with representatives of all the other lifeline service providers, and a fairly exhaustive review of newspaper accounts of 1986 and 1997 storm impacts on PG&E facilities, found in the Los Angeles Times, Sacramento Bee, and San Francisco Chronicle.

Several other power utilities were unable to attend panel meetings or were otherwise unable to estimate scenario damage and restoration. To estimate power outage and restoration for these remaining service areas, we make several assumptions, based on the panel discussions and other evidence cited below.

Sources of wind damage. According to panel participants, wooden crossbars and pole-mount transformers on distribution-voltage utility poles can be damaged by wind speeds as low as 60 miles per hour (mph). Moderate winds also can cause lines to sway, touch, and cause cross-phase shorting. Another common cause of wind damage is moderate wind speeds with windborne debris such as palm fronds blown onto lines causing shorts. Where winds are stronger, damage is more severe. Hurricane-force winds (75 mph and higher) can cause transmission lines to sway and cause cross-phase shorting, or cause electrical transmission towers or poles to collapse.

The panels did not postulate damage in high-wind regions (75 mph and higher). In Alpine, Inyo, Mono, and parts of El Dorado, Placer, Riverside, San Bernardino, and Tulare Counties, winds reach 75 to 125 mph. Figure 27 shows where high winds could threaten transmission lines. Note especially how high winds on the eastern side of the Sierra Nevada range coincide with the location of transmission lines.

Some documentation is available regarding power outage and restoration in south Florida in Hurricane Andrew (Porter and others, 1996). Peak gust velocities in a few Florida locations reached 170 mph, but in many places between Miami and Homestead peak gusts were in the range 100 mph to 125 mph (*http://www.nhc.noaa.gov/prelims/1992andfig5.gif*), similar to the most strongly affected regions in ARkStorm. About 55 percent of Florida Power and Light transmission lines were out of service because of Hurricane Andrew, (including 80 percent of the 230 kilovolt system and 60 percent of the 138 kilovolt system), along with about 70 percent of the distribution circuit miles. It took approximately 5 days for Florida Power and Light to restore service to 90 percent of its customers, and 30 days to reach 99 percent. Note that electrical facilities in hurricane country may be built to different standards in consideration of higher wind loads.

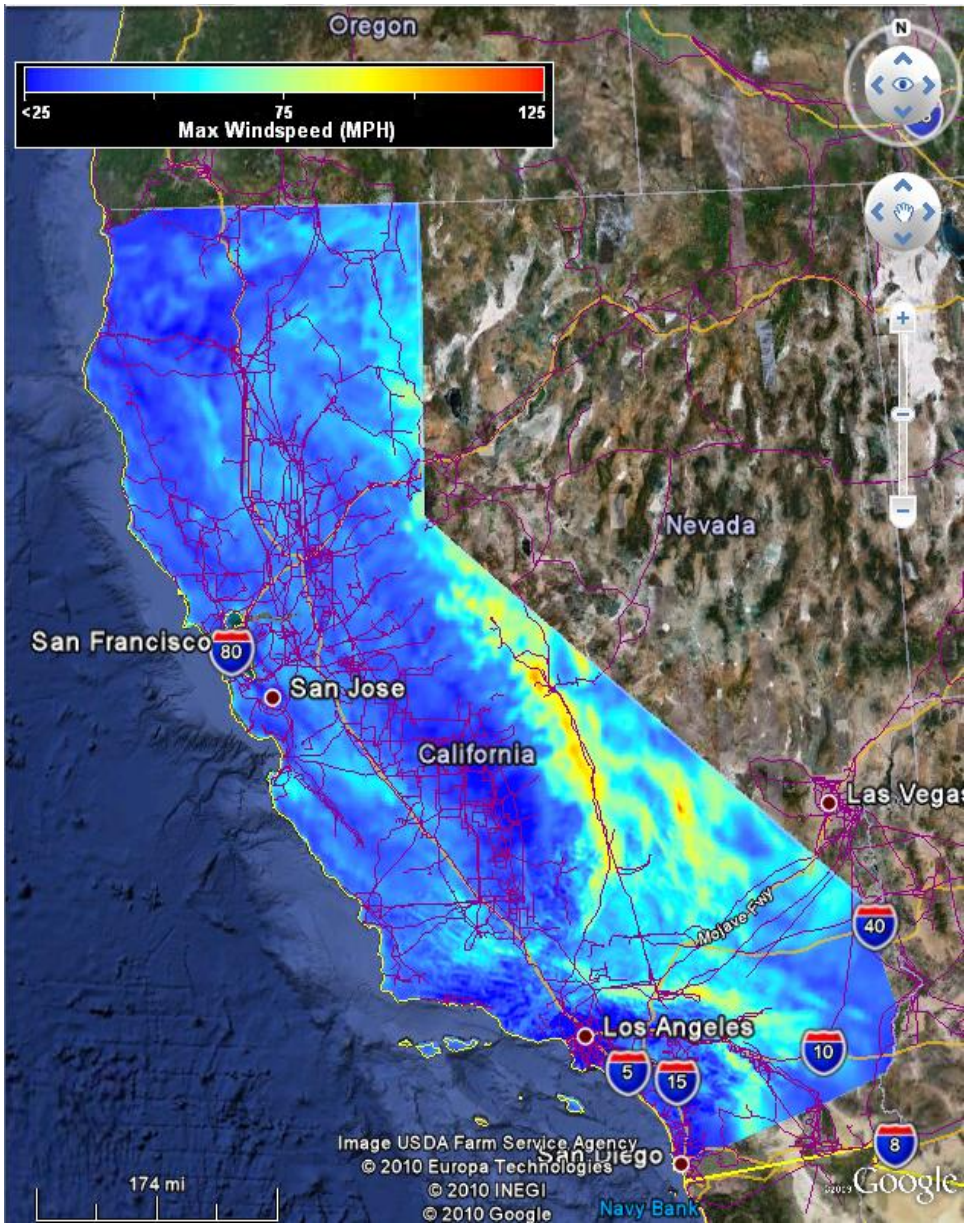

Figure 27. ARkStorm winds. Yellow indicates maximum windspeed in excess of 70 miles per hour. Red lines indicate electrical transmission lines.

Damage to wooden crossbars and pole-mount transformers was one of the more significant causes of system interruption. One panel estimated that 0.2 percent of customers in areas with peak gust velocities generally in the range of 45 to 75 mph could lose power because of wind damage to distribution poles. (Customers, as used here, are counted in electric-service meters, not inhabitants of residences or office buildings. A single-family dwelling, for example, would typically count as one customer.) Damage to poles in moderate windspeed areas is restored within 7 days of the storm.

We assume that 75 percent of customers in counties with higher winds - in the range of 75 to 125 mph - lose service, and that repairs would take 7 days to restore to 90 percent of customers and 4 weeks to restore power to almost all customers. This restoration curve, shown mathematically in Equation (1), is comparable to the restoration estimated in the confidential utility study for areas with similar, strong winds. The restoration curve is of the form:

$$f(t) = 1 - C_0 \exp(-r \cdot t) \quad (1)$$

where

f(t) is the fraction of customers with power at time t,

C_0 is the initial fraction of customers without power (for example, 0.75),

t is time in days after the peak of the storm (January 27, 2011, in southern California, February 9, 2011, in northern California), and

r is a constant reflecting speed of restoration: 0.05 for very slow restoration and 0.30 for fast restoration. A value of 0.25 is used here.

Sources of flooding damage. Power plants, high-voltage substations (also called bulk substations) and control facilities can be sensitive to flooding damage in at least two important ways. Flooding can damage control equipment. High-voltage substations and generating plants have high-voltage transformers (50 to 200 megawatts (MW) at high-voltage substations and 300 to 500 MW at generating plants) that also can be damaged by flooding, for example, by flood-borne debris impacting the transformer and ancillary equipment. A problem is that these transformers are custom made, designed to match impedance at the facility it serves, and each location serves fairly large populations: a high-voltage substation for example can serve in excess of 200,000 people. The transformers are not interchangeable and are too expensive to stockpile backups beyond those available for normal operational redundancy. If one of these large transformers were damaged, it could take 6 months or more to replace. There is typically some redundancy, enough so that at any given high-voltage substation, for example, one of these transformers can be inoperative and the substation can still operate. In addition, agreements between utilities allow for the loan or sale of surplus or idle equipment in an emergency situation. However, flooding is a common-cause failure mode, the implication being that a flood can damage several components simultaneously, potentially damaging two or more of these transformers. Were this to happen, the utility would have to reroute power around the inoperative substation, which could take a few days, and immediately attempt to repair or replace the transformer once dewatering is completed. The reliability of the temporary grid layout would be reduced, meaning greater likelihood of power outages in the affected area.

Flooding also can damage equipment at generation facilities. If demand were high (less likely in the winter months in which the ARkStorm is postulated to occur), temporary emergency generation such as diesel generators—and the necessary fuel supplies—might have to be brought in to serve the affected areas. Figure 28 shows where power plants are located in relation to

flooded areas in four metropolitan areas of the state. While most power plants are located out of the flooded areas, some are inside, especially in Santa Clara County and Los Angeles.

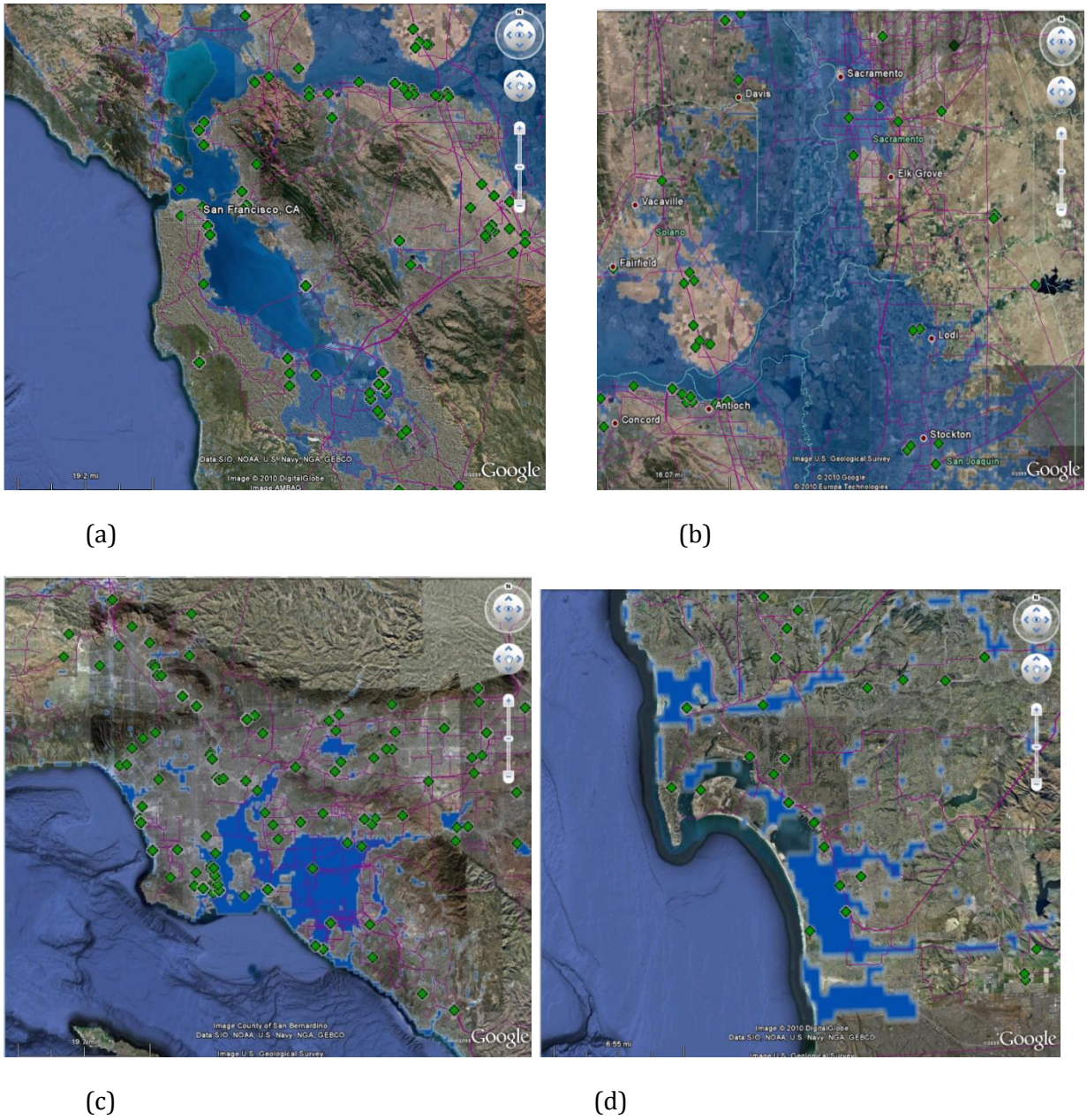

Figure 28. Power plants (green diamonds) overlain with flooding (blue areas) in (a) San Francisco Bay Area, (b) Sacramento and Stockton, (c) Los Angeles and Orange Counties, and (d) San Diego.

POWER DAMAGE AND RESTORATION SCENARIO

One panel concluded that power is shut off to all flooded areas, and that electric-power utilities will restore power to customers who are affected by flooding shortly after the buildings are determined by local authorities to be safe to enter and occupy. We assume that this adds between 1 and 14 days to the downtime of all facilities with nonzero flood-related downtime. A median value

of 7 days is used throughout. However, since according to the HAZUS-MH flood module the time required to restore flooded buildings to operation is measured in months rather than days, restoration of power to flooded buildings is judged not to add significantly to their downtime.

However, it seems likely that there will be large areas that are not flooded, but that flooding of at least a few feet above grade (perhaps 3 or 4 feet) could damage the electrical and electronic equipment in the substations that serve the main stations. Of special concern are the high-voltage substations, discussed above, which tend to serve a large geographic area (on the order of 200,000 people). This damage could isolate those neighborhoods, either because the neighborhoods are near the end of a transmission or distribution line and lack a redundant path, or because all transmission to that area seems to run through substations that are flooded.

Using the HSIP Gold geospatial database of transmission lines and substations, we created an approximate inventory of the affected substations, and roughly approximated the fraction of the population of each county affected by the damage. We assumed that this fraction is without power, and that restoration takes up to 4 weeks, and applied the following restoration curve:

$$\begin{aligned} f\ t &= 1 - C_0 && t \le d \\ &= 1 - C_0 \exp\ -r\ t - d && t > d \end{aligned} \qquad (2)$$

where

C_0 is the fraction of services assumed to be affected by substation flooding,

t is the number of days after the end of the storm (January 27 and February 9, in southern and northern California, respectively), and

d is the duration of flooding.

The foregoing considerations lead to the power restoration curves shown in table 1. The first column contains the county name, the second is Federal Information Processing Standard (FIPS) code. The column labeled peril denotes whether wind (W) or flood (F) dominates the cause of power failure to customers able to receive power. Column 4, labeled C_0, denotes the estimated percentage of customers initially without power after the storm. The remaining columns reflect the estimated percentage of customers able to receive power that do have power service, by date. Figure 29 illustrates these curves in a few key locations.

It is estimated that the material and labor required to repair power facilities could cost between $300 million and $3 billion. For present purposes, the scenario posits the cost as the geometric mean (meaning the square root of the product) of these two figures, that is, $1 billion.

Table 1. Power restoration (percent of customers receiving power).
[FIPS, Federal Information Processing Standard; W, wind; F, flood; C_0, percentage of customers initially without power after the storm; %, percent]

County	FIPS code	Peril	C_0	Power 1/27/2011	2/3/2011	2/10/2011	2/17/2011	2/26/2011	3/13/2011	3/28/2011	4/27/2011	5/27/2011	6/26/2011	7/26/2011	8/25/2011	9/24/2011
Alameda	06001	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Alpine	06003	W	25.0%	100%	100%	81%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Amador	06005	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Butte	06007	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Calaveras	06009	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Colusa	06011	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Contra Cos	06013	F	5.0%	100%	100%	96%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Del Norte	06015	F	10.0%	100%	100%	92%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
El Dorado	06017	W	50.0%	100%	100%	61%	93%	99%	100%	100%	100%	100%	100%	100%	100%	100%
Fresno	06019	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Glenn	06021	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Humboldt	06023	F	5.0%	100%	100%	96%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Imperial	06025	F	8.0%	92%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Inyo	06027	W	50.0%	50%	58%	60%	78%	87%	88%	89%	91%	93%	94%	96%	98%	100%
Kern	06029	F	5.0%	100%	100%	95%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Kings	06031	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Lake	06033	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Lassen	06035	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Los Angel.	06037	F	30.0%	70%	91%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Madera	06039	F	10.0%	100%	100%	90%	90%	99%	100%	100%	100%	100%	100%	100%	100%	100%
Marin	06041	F	50.0%	100%	100%	59%	93%	99%	100%	100%	100%	100%	100%	100%	100%	100%
Mariposa	06043	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mendocino	06045	F	10.0%	100%	100%	92%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Merced	06047	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Modoc	06049	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mono	06051	W	100.0%	0%	5%	13%	16%	30%	37%	45%	61%	79%	87%	95%	97%	100%
Monterey	06053	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Napa	06055	F	10.0%	100%	100%	92%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Nevada	06057	F	50.0%	100%	100%	50%	50%	95%	100%	100%	100%	100%	100%	100%	100%	100%
Orange	06059	F	21.0%	79%	94%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Placer	06061	W	20.0%	100%	100%	84%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Plumas	06063	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Riverside	06065	W	21.0%	79%	94%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sacramento	06067	F	25.0%	100%	100%	75%	75%	75%	98%	100%	100%	100%	100%	100%	100%	100%
San Benito	06069	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
S. Bernard.	06071	W	21.0%	79%	94%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Diego	06073	F	15.0%	85%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
S Francisco	06075	F	50.0%	100%	100%	59%	93%	99%	100%	100%	100%	100%	100%	100%	100%	100%
S Joaquin	06077	F	25.0%	100%	100%	75%	75%	75%	98%	100%	100%	100%	100%	100%	100%	100%
S L Obispo	06079	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Mateo	06081	F	50.0%	100%	100%	59%	93%	99%	100%	100%	100%	100%	100%	100%	100%	100%
Sta Barbara	06083	F	69.0%	31%	44%	63%	63%	84%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Clara	06085	F	10.0%	100%	100%	92%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Cruz	06087	F	10.0%	100%	100%	92%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Shasta	06089	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sierra	06091	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Siskiyou	06093	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Solano	06095	F	5.0%	100%	100%	96%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sonoma	06097	F	10.0%	100%	100%	92%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Stanislaus	06099	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sutter	06101	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tehama	06103	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Trinity	06105	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tulare	06107	W	5.0%	50%	58%	60%	78%	87%	88%	89%	91%	93%	94%	96%	98%	100%
Tuolumne	06109	W	0.2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Ventura	06111	F	69.0%	31%	44%	63%	63%	84%	100%	100%	100%	100%	100%	100%	100%	100%
Yolo	06113	F	10.0%	100%	100%	90%	90%	90%	99%	100%	100%	100%	100%	100%	100%	100%
Yuba	06115	F	10.0%	100%	100%	90%	90%	99%	100%	100%	100%	100%	100%	100%	100%	100%

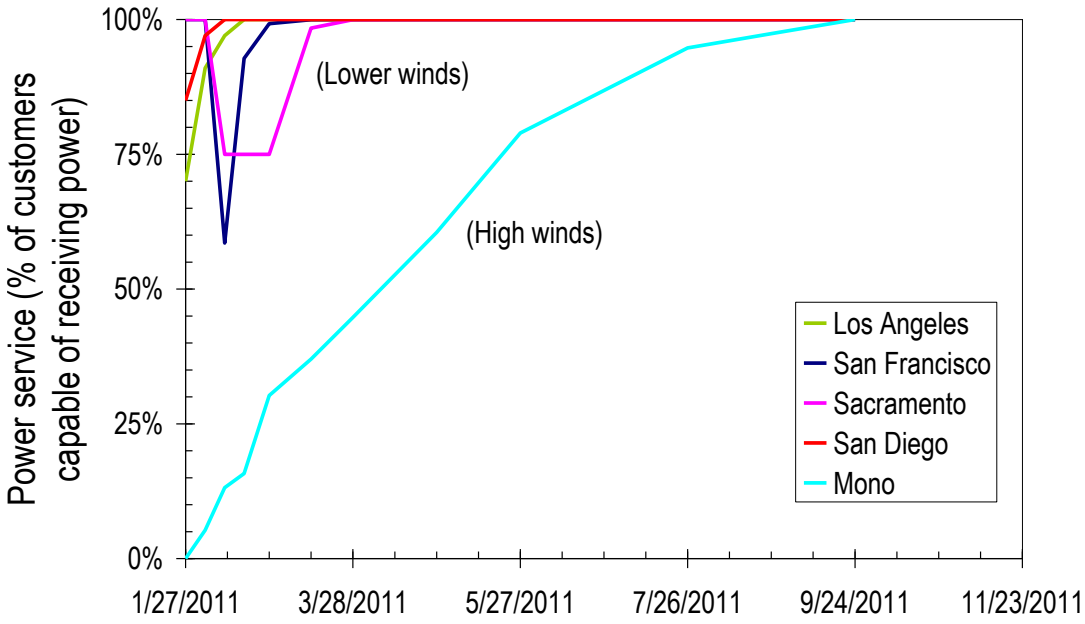

Figure 29. Power restoration curves at a few key locations, showing percentage of customers capable of receiving power at selected times.

LIFELINE INTERACTION INVOLVING POWER

As with ShakeOut, damage to other lifelines can impact the restoration of power. As examples, roadway damage can hinder electric utilities from getting to affected areas and performing repairs. Telecommunications failure can hinder the reporting of any damage to the utilities, as well as hindering repair coordination.

OPPORTUNITIES TO ENHANCE POWER RESILIENCY

One panelist observed that all California electric utilities are required to perform preventive maintenance under California Public Utilities Commission (CPUC) general order 165. He also noted that all California electric utilities are familiar with FEMA reporting and the appropriate forms for financial relief. The following methods for enhancing power resiliency were identified during panel discussions or in subsequent conversations and correspondence.

- Convert overhead bare conductors to underground cable in conduit. However, this conversion can be very costly (up to $1 million per mile in urban areas, or 5 times the cost of new overhead construction). This conversion raises new issues and challenges such as coordinating and routing several congested utilities, providing an adequate cathodic protection and protection from water. Lifecycle costs might be different and would have to be investigated to determine if the economical feasibility to perform this conversion.
- Elevate transformers and control equipment at substations to protect from flooding.
- Pre-position repair crews based on severe weather forecasts.

- Send utility inspection crews to check for hazardous conditions at substations.
- Train utility workers to document damage in the detail required for government assistance.
- Promote the design and acquisition of a mobile, high-voltage transformer that has ability for the user to easily change the internal impedance and the turns ratio. This innovation would mitigate the problem of long lead times to replace damaged high-voltage transformers. One panelist acknowledged the potential value of such a transformer; another expressed skepticism that such a design is, in fact, feasible.
- One panelist suggested promoting the design and acquisition of a mobile, modular substation complete with all the relays, circuit breakers, and controls capable to service one distribution station or a receiving station.
- Finally, there seemed to be broad consensus that mutual assistance among power utilities is key in any major disaster. Having the right spare equipment also is imperative.

LIMITATIONS OF ESTIMATES WITH RESPECT TO POWER

This approach was a best estimate for a highly uncertain situation. It is particularly uncertain for the areas not addressed by panel discussions. Damage to power system components from landslides is not accounted for, nor is any special consideration made of shutdown of nuclear power plants or of other generating facilities not in the flooded areas. PG&E and some other utilities were unable to participate in developing the scenario. Had these utilities participated, the scenario would have been more accurate. These limitations argue for a more thorough assessment by PG&E and other utilities.

Wastewater Treatment

WASTEWATER FACILITIES AND SOURCES OF DAMAGE

Wastewater treatment systems typically comprise sewer pipes (laterals from customers to the street; collectors, truck sewers, interceptors, and outflow structures), pumping stations (also called lift stations), and wastewater treatment plants (WWTPs). Pipes tend to be relatively brittle, constructed of vitrified clay or reinforced concrete, but some structures are aging, brick-lined tunnels or tunnels lined with unreinforced concrete. Sewer flow is typically driven by gravity and aided by lift stations. Sewer pipes can be damaged by landsliding and in some cases by scour, especially external scour to shallow cut-and-cover tunnels. Sewer pipes also can be damaged by ground settlement and other movement aggravated by soil becoming saturated after multiple storms. The primary cause of damage to pumping stations and WWTPs discussed in panels was flooding damage to electrical equipment and sediment getting into pumps. We begin by discussing damage to WWTPs.

Although there is an incomplete spatial database of WWTPs, discussed below, we are unaware of any complete inventory or GIS system describing all or even a significant fraction of California sewer systems. Roughly 135 WWTPs and an unknown number of sewage pumping stations (also called lift stations) operate in California. Flooding can damage these facilities, especially by damaging electrical equipment or by floating or buckling storage tanks. The degree of damage to electrical equipment depends on whether the equipment is deenergized before flooding. The damage is worse if the equipment is not deenergized before being powered down, which can happen if flooding occurs without sufficient advanced warning or at night when minimal crews are on hand to shut down equipment. When a WWTP or lift station is flooded and shut down, untreated sewage may emerge from nearby maintenance holes and wetwells, and flow by gravity overland to

nearby rivers or shorelines, contaminating a radius of up to ½ to 1 mile around the point of sewage discharge if the flooding reaches that far. Once the sewage enters a stream, creek, or river, the distance of contamination can far exceed the ½ to 1 mile distance. The contaminated area potentially can require evacuation of homes and businesses. In addition to the soft-term health impacts, any agricultural fields with sewerage in nearby streams may cause the crops to be deemed unsafe.

WWTPs tend to be in low-lying areas and, therefore, more subject to flooding than the population served. A spatial database of WWTPs is available in the HSIP Gold 2007 database. It shows 21 WWTPs in inundated areas (out of 113 California WWTPs shown in database). The HSIP Gold 2007 database appears to be incomplete, however, and is missing at least 24 WWTPs, 7 of which lie in the hypothetically flooded areas: 2 in Amador County (neither flooded), 1 in Colusa County (not flooded), 4 in Imperial County (none flooded), 3 in Madera County (none flooded), 1 in Modoc County (not flooded), 1 in Los Angeles County (flooded), 1 in Sacramento County (not flooded, because of floodwall protection designed for 500-year flooding), 2 in San Francisco (neither in the hypothetically flooded areas, however), 3 in Santa Cruz (none flooded), 1 in Sutter County (flooded), 3 in Tehama County (1 possibly flooded), 3 in Yolo County (all in the hypothetically flooded areas). The list of counties with known WWTPs in the scenario flooded area is shown in table 2. The table lists, by county, the peak flooding depth (anywhere in the county) along with flooding duration, number of WWTPS known to be in the hypothetically inundated area, both as a number and as a fraction of the WWTPs shown in the HSIP Gold 2007 database and supplemented here by Google Earth searches. (After the development of the table, we found that an U.S. Environmental Protection Agency database reflected much of the missing information, though not all, and not in a convenient format. The database would have required extensive interpretation to be useful, and so is not reflected here.)

Table 2. Wastewater treatment plants (WWTP) in scenario flooding areas, per county. With maximum flooding, duration of flooding, number and percentage of flooded WWTPs. [ft, feet; WWTPs, wastewater treatment plants; %, percent; <, less than]

County	Peak depth, ft	Duration, days	Flooded WWTPs	% Total WWTPs
Alameda	3-10	<0.5	1	25
Butte	<3	0.5-3	1	100
Contra Costa	3-10	<0.5	1	10
Los Angeles	3-10	<0.5	2	20
Marin	3-10	<0.5	2	40
Orange	3-10	<0.5	4	57
Tehama	<3	0.5-3	1	33
San Diego	3-10	<0.5	1	17
San Joaquin	10-20	14-28	2	67
San Mateo	3-10	<0.5	2	67
Santa Clara	3-10	<0.5	3	100
Sonoma	3-10	<0.5	1	100
Sutter	3-10	3-14	1	100
Ventura	3-10	<0.5	1	25
Yolo	10-20	14-28	3	100
Yuba	3-10	3-14	1	100
Total			27	

WASTEWATER DAMAGE AND RESTORATION SCENARIO

Following is a description of damage and restoration discussed in the Pasadena wastewater treatment panel. This description is offered as a pattern for emergency planning purposes.

Flooding at pumping stations and WWTPs. In Los Angeles, the scenario imagines that the Donald C. Tillman and Terminal Island WWTPs are flooded. The former floods the central and western San Fernando Valley. Raw sewage emerges from the 50 nearest maintenance holes, and flows overland to the Los Angeles River, causing a hazardous material condition that could trigger evacuation of homes and businesses that were not otherwise flooded, and shutting down roads through the affected area.

At Terminal Island, the Terminal Way pumping plant is submerged, and sewage is not pumped to Terminal Island because of the loss of power. Terminal Island is in danger of being isolated, causing a life-safety threat to employees, and is evacuated. Raw sewage emerges near the Terminal Way pumping plant and runs untreated to the Pacific Ocean. Near Venice Beach, the Venice Pumping Plant is briefly submerged, and sewage is not pumped to the Hyperion WWTP. Instead the sewage emerges from wetwells and maintenance holes between Santa Monica and Venice and runs overland to the Pacific Ocean. Similar effects would occur near other flooded WWTPs.

Pipeline damage and restoration. Landslides cause localized damage to sewer pipes throughout the area. Flooding also can carry large amounts of sediment into sewer pipes; one panel estimated that 10-15 percent of pipes in flooded area will have large amounts of sediment that will need to be cleaned out. Sewer pipe damage will continue to emerge for several months after the storm; the Menlo Park panel estimated that repairs to sewer pipes in the San Francisco Bay area could cost on the order of $60 million, realized over the 6 months after the storm. Scaling up solely by population, this suggests statewide sewer pipe repairs costing on the order of $300 million, that is, roughly $9 per resident, on average. Cities with more intense rainfall and older sewer systems will experience greater-than-average sewer damage rates.

In Los Angeles, one important point of significant damage is the north outfall sewer, which zigzags under the Los Angeles River. This aging structure is partly brick-lined, partly lined with unreinforced concrete. It is a shallow, cut-and-cover structure, and it seemed possible to some panelists that the sewer could be damaged by external scour near the river.

It is uncertain how long repairs would take to restore damaged electrical equipment. One panel felt that, if the equipment is deenergized before being wetted, the equipment can be dried and reenergized within a day of floodwaters receding; otherwise short-circuited equipment might take weeks or more to replace. Another panel disagreed with the notion that deenergized equipment could be dried and quickly restored to service, and felt instead that flooded electrical equipment could be contaminated with silt and have to be replaced, which might take months (one panel suggested 3-6 months). As a middle ground, we have perhaps optimistically assumed that service is restored within 4 weeks after floodwaters recede from WWTPs. This assumption needs checking.

For purposes of estimating economic impacts of the failure of sewer service, the percentage shown in table 2 is taken as the fraction of customers whose sewer service is rendered unavailable beginning near the peak of the storm, then continuing for the duration of flooding noted in the table, with an additional 2 days to 4 weeks, to account for the time required to repair or replace electrical equipment. Service restoration is assumed to follow the same exponential curve form as

before, that is, Equation (2), where now f(t) denotes the fraction of customers with sewer service, C_0 denotes the fraction of services assumed to be affected by WWTP flooding, t again is the number of days after the end of the storm (January 27 and February 9, in southern and northern California, respectively), and d is the flooding duration. The parameter r is a constant, this time set to 0.15 to cause the calculated fraction of sewer services restored to be 65 percent of services within 1 week after flooding recedes, and 99 percent restored within 4 weeks after flooding recedes.

The results are tabulated in table 3. Note well that C_0 includes all customers, including residences, businesses, and other facilities that are rendered unoccupiable by flooding or other damage.

Table 3. Sewer service restoration per county over time after the ARkStorm.

[FIPS, Federal Information Processing Standard; C_0, percentage of customers initially without power after the storm; %, percent]

County	FIPS	C_0	1/27/11	2/3/11	2/10/11	2/17/11	2/26/11	3/13/11	3/28/11	4/27/11	5/27/11	6/26/11	7/26/11	8/25/11	9/24/11
Alameda	06001	25%	100%	100%	78%	92%	98%	100%	100%	100%	100%	100%	100%	100%	100%
Alpine	06003	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Amador	06005	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Butte	06007	100%	100%	100%	0%	59%	89%	99%	100%	100%	100%	100%	100%	100%	100%
Calaveras	06009	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Colusa	06011	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Contra Costa	06013	10%	100%	100%	91%	97%	99%	100%	100%	100%	100%	100%	100%	100%	100%
Del Norte	06015	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
El Dorado	06017	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Fresno	06019	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Glenn	06021	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Humboldt	06023	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Imperial	06025	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Inyo	06027	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Kern	06029	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Kings	06031	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Lake	06033	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Lassen	06035	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Los Angeles	06037	20%	80%	93%	97%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Madera	06039	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Marin	06041	40%	100%	100%	64%	87%	97%	100%	100%	100%	100%	100%	100%	100%	100%
Mariposa	06043	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mendocino	06045	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Merced	06047	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Modoc	06049	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mono	06051	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Monterey	06053	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Napa	06055	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Nevada	06057	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Orange	06059	57%	43%	79%	93%	97%	99%	100%	100%	100%	100%	100%	100%	100%	100%
Placer	06061	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Plumas	06063	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Riverside	06065	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sacramento	06067	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Benito	06069	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Bernardino	06071	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Diego	06073	17%	83%	94%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Francisco	06075	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Joaquin	06077	67%	100%	100%	33%	33%	33%	87%	99%	100%	100%	100%	100%	100%	100%
San Luis Obispo	06079	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Mateo	06081	50%	100%	100%	55%	84%	96%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Barbara	06083	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Clara	06085	100%	100%	100%	11%	69%	92%	99%	100%	100%	100%	100%	100%	100%	100%
Santa Cruz	06087	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Shasta	06089	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sierra	06091	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Siskiyou	06093	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Solano	06095	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sonoma	06097	100%	100%	100%	11%	69%	92%	99%	100%	100%	100%	100%	100%	100%	100%
Stanislaus	06099	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sutter	06101	100%	100%	100%	0%	0%	74%	97%	100%	100%	100%	100%	100%	100%	100%
Tehama	06103	33%	100%	100%	67%	86%	96%	100%	100%	100%	100%	100%	100%	100%	100%
Trinity	06105	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tulare	06107	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tuolumne	06109	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Ventura	06111	25%	75%	91%	97%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Yolo	06113	100%	100%	100%	0%	0%	0%	81%	98%	100%	100%	100%	100%	100%	100%
Yuba	06115	100%	100%	100%	0%	0%	74%	97%	100%	100%	100%	100%	100%	100%	100%

LIFELINE INTERACTION INVOLVING WASTEWATER TREATMENT

Some lift stations may be equipped with backup power, although none were identified in our panels. Lacking commercial power or backup power these stations cannot operate. Many WWTPs are provided with onsite electrical power. A San Francisco panelist reported that all San Francisco WWTPs have emergency generators (generally somewhat elevated above grade) with sufficient capacity to power the WWTP during normal power interruptions, and believed the same to be true at East Bay Municipal Utility District (EBMUD) facilities. If the emergency generators run on diesel or other fuel other than piped natural gas, then the generators are susceptible to running out of fuel within 3-5 days if roadway damage or flooding were to affect fuel delivery. We, therefore, assume that, in general, when commercial power is unavailable, lift stations do not operate but many WWTPs may function. Furthermore, since sewer lines are co-located with streets, where lift stations and WWTPs cease to function, untreated sewage can emerge onto streets, causing hazmat conditions that cause road closures and hinder repairs to other lifelines. One panel estimated that, in Marin County, 2 to 5 percent of street miles might have raw sewage on roads. Cleaning up sewage spills often uses large amounts of fresh water.

RESILIENCY AND RESEARCH NEEDS FOR WASTEWATER SERVICE

The following opportunities were discussed for enhancing the resilience of wastewater service, either by reducing damage, by speeding restoration, or by otherwise reducing the impacts of damage.

- Utilities (perhaps in collaboration with FEMA) anticipate and budget for the opportunity to restore wastewater systems to greater-than-pre-storm capacity. Some panelists believed that when using FEMA public assistance funds after federally declared disasters, facilities had to be restored to predisaster condition, that is, that FEMA would not provide the equivalent amount of funding if the utility restored to higher capacity, even if the utility made up the difference in cost itself. A FEMA program officer involved in the discussion was unsure of the accuracy of that statement, but nonetheless the subject is worth investigating.
- Consider adding or enhancing floodwalls around critical facilities such as WWTPs, or elevating sensitive electrical and mechanical equipment, conduit, and bus bar (a bar that conducts electrical current) above extreme flooding stage.
- Enhance backup power and onsite fuel capabilities where cost effective. Where FEMA hazard mitigation grants are available, consider among the benefits the avoided health and agricultural impacts and loss of functionality of evacuated dwellings and businesses. Onsite backup power can produce benefits in terms of losses avoided from earthquake as well as floods.
- Develop or review contingency plans for monitoring weather forecasts and the impacts on local facilities; and for deenergizing sensitive electrical equipment, especially considering night-shift crews, when there are fewer staff available; and facilities with limited ability to see rising rivers nearby.
- Stockpile common electrical equipment or create a common national database of backup electrical equipment and the means to transfer and install it quickly.
- One panelist (Craig Davis) recommended that “drains, conduits (storm channels and pipes), and storm detention/retention basins be inspected periodically (probably at least annually) and where needed, cleaned of debris and sediments to ensure they retain their design capacity. Drains or channels also include the benches placed on slopes to help protect the slope stability. This might sound like something that is obvious, which it is, but it costs money and time and many organizations and private property owners simply do not do this. We inspect and clean in some areas, but not all. Even where known, we cannot always find the labor or money to clean out some areas for every winter. In 2005, we learned that

the lack of even some of the simplest cleaning of bench drains on our slopes can be critical to preventing storm related slope stability and debris flow problems. Once a problem arises it is easy to see that the cost of repair is far greater than the annual saving by not keeping the drains, conduits, and basins cleaned on an annual basis…. Some agencies do a pretty good job with the basins and major channels. One that stands out in my mind is LA County Flood Control District."

We encountered some limitations of available knowledge in preparing this scenario that suggest research needs:

- The HSIP Gold 2007 database has major gaps in data on the location of wastewater treatment facilities (WWTPs). Furthermore, there appears to be no information linking WWTPs to particular watersheds, nor is there data about the locations of major sewer lines or lift stations. There is no centralized information about WWTP capacities, provision of onsite power, elevation of electrical and sensitive mechanical and plumbing equipment is available. WWTP facilities and vulnerabilities vary enormously, which makes the performance of studies such as this one problematic especially if the studies cross district boundaries.
- There was a difference of opinion as to whether flooded electrical equipment needs to be replaced, and no information is readily available as to replacement times. (This latter point is changing with the development of ATC-58, a FEMA-funded effort to codify 2nd-generation performance-based earthquake engineering. Part of that effort involves compiling a database of repair and replacement time for common mechanical, electrical, and plumbing equipment.)

Water Supply

WATER FACILITIES AND SOURCES OF DAMAGE

About 95 percent of Californians get their water from a public, municipal source. About 324 water districts in California and more than 8,000 small public water systems serve 6 to 7 percent of the population. Figure 30 shows the larger districts, including federal, regional, state, and municipal water districts. A map of the state's major water projects is shown in figure 31. A map of about 1,500 dams in the state in the HSIP Gold 2007 database is shown in figure 32; these include the 1,250 dams regulated by the California Division of Safety of Dams (DSOD). The other 250 dams are either federal dams, or exempt, or below the size threshold that would place the dams under DSOD jurisdiction. Between 60 and 65 percent of statewide water use comes from surface-water supplies; the balance from ground water, though nearly half of Californians rely to some extent on ground water. Ground-water use is most intense in regions with limited access to surface water. According to the California Department of Water Resources, over 80 percent of water use in the Central Coast region comes from ground water, as does about 70 percent of water use in the southern Sierra. The general geographic distribution of the state's 35,000 monitored wells is shown in figure 33, which shows wells for which the California Department of Water Resources maintains hydrographic data in its Water Data Library (WDL) system. The drinking water for about 1.6 million people comes from over 600,000 private domestic wells (not shown).

WATER SUPPLY DAMAGE AND RESTORATION SCENARIO

During panel discussions with water-supply service providers, several significant damage modes were identified. One was contamination of wellheads and flood damage to electrical equipment serving pumps at the wellhead. The damage mode was identified by representatives of a southern California water district serving 65,000 people, who observed that the district had hundreds of wellheads in dry riverbeds, and that some might have poor sanitary seals. Within one basin, it seemed realistic that a limited plume of untreated sewage could contaminate a significant

part of the aquifer in one basin, interrupting water-supply service to perhaps 25 percent of the utility's customers. Restoration would involve repairing damaged electrical equipment and cleaning the wells. Repairs to that system could cost $100 million and take 2 to 4 weeks if the system were properly shut down before electrical shorts could occur; otherwise repairs could plausibly cost $1 billion and take up to 6 months. Scaling up from the smaller figure for this relatively small water district, repair costs for water supply for a larger water district could plausibly range from $1-$10 billion; we have estimated $3 billion here.

Two northern California water utilities that rely on ground water echoed the same concern, suggesting that it was realistic for half of their wells to be impacted. Representatives from one of the two utilities felt that its wellheads could be disinfected and water supply restored approximately 3 days after floodwaters receded and power was restored. Its wellheads are supplied by backup power—emergency generators powered by natural gas with some onsite storage—although because the electrical equipment is located at ground level, the generator and its electrical equipment would be damaged, rendered nonfunctional, and have to be replaced.

Other damage modes identified during panel discussions include:

- Flooding damage to electrical and other equipment at water treatment plants (WTP). Panelists' estimates for restoration time varied widely, from 2 days to 6 months, generally over the question of whether the flooded electrical equipment could be dried and reenergized, or would have to be replaced. One panelist suggested that WTP serving the entire city of Sacramento would be inoperative for up to 3-6 months.
- Loss of water transmission from northern to southern California because of damage from overtopping of levees in the Sacramento Delta or aqueduct damage caused by flash flooding. (For example, flash flooding in the Arroyo Pasajaro could disable the California Aqueduct between Tracy and Coalinga, as happens elsewhere periodically.) About half of southern California's water comes from the Delta. Panel participants felt that it was realistic for levee repairs necessary to restore conveyance to southern California to take 3 months. (Not the same as the amount of time required to repair all levee breaches and dewater flooded islands, which would probably be several years.) Note, however, that between ground water and other local supplies, alternate routes, reduced winter demand, and conservation, panelists felt that southern California would not lack for water solely because of levee and aqueduct damage to northern California supplies. Panelists and others have noted that southern California has one of the most robust water-supply systems in the world.
- Greatly increased turbidity in surface water because of runoff carrying sediments into reservoirs and because of erosion of the banks of reservoirs. Panelists concluded that in southern California at least, water quality would be a far more significant problem than quantity, primarily in that filters would have to be flushed frequently, and that there would be concerns of contaminants from runoff potentially requiring extended boil-water orders.
- Loss of power. Many water service providers rely on power to operate pumps. Those pumps that have onsite backup power tend to have generators and electrical equipment at grade, meaning that if they are flooded, the generator and electrical equipment would be damaged, rendered inoperative, and have to be replaced.
- Landslides could damage tanks on hillsides. The example cited was tanks near the Seven Oaks Dam in Devils Canyon.
- Pipes that cross canyons could be damaged by debris flows. The example cited was debris flow out of the Santa Ana River into the pickup for North Fork Irrigation and the City of Redlands. The pipe serves about 50,000 people, though it is not the sole source of water.
- Pipes collocated on bridges could be damaged if the bridges are damaged, for example, by foundation scour.

Debris flows could damage local water distribution systems, for example, by breaking enough service connections where the pipes rise into houses to reduce pressure locally until the damage can be valved off. Panelists and ARkStorm landslide experts estimated that perhaps 100-200 neighborhoods of on the order of 20 to 50 homes each could lose water supply as a result of debris flows.

From these observations, producing a quantitative, statewide damage and restoration scenario for water supply is challenging. The damage and restoration scenario depicted here is, therefore, intended primarily for purposes of economic analysis, and relies on the following simplifications: Water supply impacts in Central Valley counties are primarily caused by flooding damage to electrical equipment at water treatment plants and wellheads, and contamination of wells. The Central Valley counties with the most severe flooding are Glenn, Butte, Colusa, Sutter, Yuba, Yolo, Sacramento, San Joaquin, Merced, and Kings; for these we assume that 50 percent of water supply is lost during the duration of flooding and for 14 days thereafter. Supply is then gradually restored, reaching 99 percent restoration within 3 months. The same restoration curve is applied to Orange County, because of severe flooding. In Central Valley counties with less flooding (Fresno, Madera and Kern), 15 percent of the county's water supply is assumed to be impacted during the duration of flooding plus 7 days, and is gradually restored, reaching 99 percent of pre-storm capacity within 30 days. In southland counties with moderate flooding (Los Angeles and Ventura), we assume that the primary impacts are contamination of wells and damage to electrical equipment at wellheads, affecting 10 percent of water supply for the duration of flooding plus 7 days, with 99 percent of capacity restored within 30 days. Loss of water supply in other counties is assumed to be negligible from a macroeconomic perspective. Results are shown in table 4 and figure 34.

Figure 30. The larger water districts among the 324 federal, regional, state, and municipal water districts in California. Colors of districts varied to improve visibility.

Figure 31. Major state water projects (modified from California Department of Water Resources, 2005).

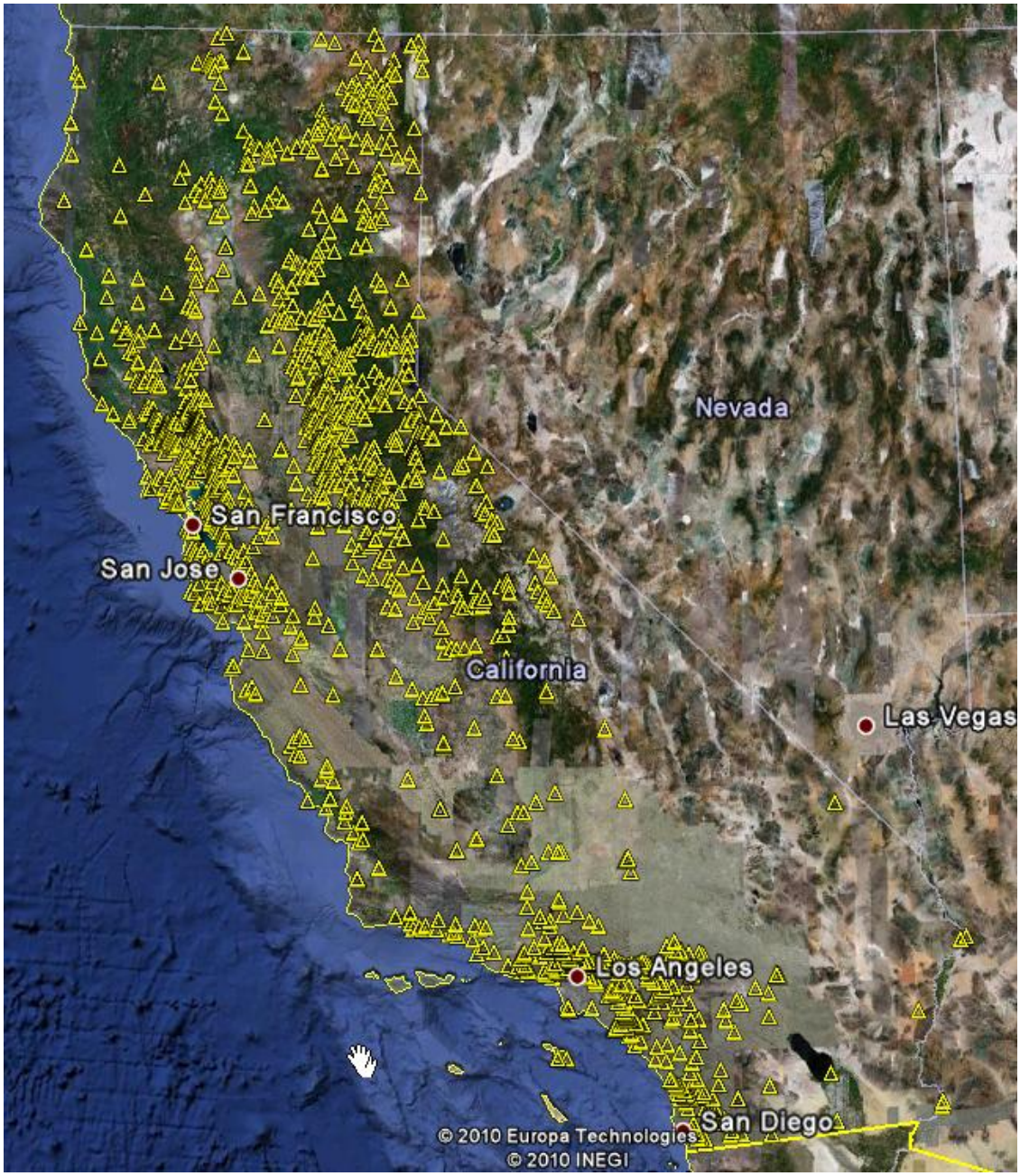

Figure 32. Locations of California dams (yellow triangles). Only a fraction is for water-supply purposes.

Figure 33. Locations of 35,000 water wells in California (Department of Water Resources Integrated Water Resources Information System).

Table 4. Water service restoration per county over time.

[FIPS, Federal Information Processing Standard; C_0, percentage of customers initially without power after the storm; %, percent]

County	FIPS	C_0	1/27/2011	2/3/2011	2/10/2011	2/17/2011	2/26/2011	3/13/2011	3/28/2011	4/27/2011	5/27/2011	6/26/2011	7/26/2011	8/25/2011
Alameda	06001	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Alpine	06003	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Amador	06005	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Butte	06007	50%	100%	50%	50%	53%	81%	92%	99%	100%	100%	100%	100%	100%
Calaveras	06009	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Colusa	06011	50%	100%	50%	50%	50%	73%	89%	98%	100%	100%	100%	100%	100%
Contra Costa	06013	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Del Norte	06015	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
El Dorado	06017	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Fresno	06019	15%	100%	85%	85%	92%	99%	100%	100%	100%	100%	100%	100%	100%
Glenn	06021	50%	100%	50%	50%	53%	81%	92%	99%	100%	100%	100%	100%	100%
Humboldt	06023	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Imperial	06025	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Inyo	06027	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Kern	06029	15%	100%	85%	85%	92%	99%	100%	100%	100%	100%	100%	100%	100%
Kings	06031	50%	100%	50%	50%	50%	77%	91%	98%	100%	100%	100%	100%	100%
Lake	06033	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Lassen	06035	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Los Angeles	06037	10%	90%	96%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
Madera	06039	15%	100%	85%	85%	88%	98%	100%	100%	100%	100%	100%	100%	100%
Marin	06041	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mariposa	06043	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mendocino	06045	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Merced	06047	50%	100%	50%	50%	50%	73%	89%	98%	100%	100%	100%	100%	100%
Modoc	06049	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mono	06051	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Monterey	06053	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Napa	06055	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Nevada	06057	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Orange	06059	50%	50%	50%	67%	81%	92%	97%	99%	100%	100%	100%	100%	100%
Placer	06061	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Plumas	06063	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Riverside	06065	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sacramento	06067	50%	100%	50%	50%	50%	50%	76%	96%	99%	100%	100%	100%	100%
San Benito	06069	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Bernardino	06071	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Diego	06073	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Francisco	06075	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Joaquin	06077	50%	100%	50%	50%	50%	50%	76%	96%	99%	100%	100%	100%	100%
San Luis Obispo	06079	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Mateo	06081	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Barbara	06083	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Clara	06085	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Cruz	06087	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Shasta	06089	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sierra	06091	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Siskiyou	06093	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Solano	06095	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sonoma	06097	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Stanislaus	06099	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sutter	06101	50%	100%	50%	50%	50%	73%	89%	98%	100%	100%	100%	100%	100%
Tehama	06103	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Trinity	06105	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tulare	06107	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tuolumne	06109	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Ventura	06111	10%	90%	96%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%
Yolo	06113	50%	100%	50%	50%	50%	50%	76%	96%	99%	100%	100%	100%	100%
Yuba	06115	50%	100%	50%	50%	50%	73%	89%	98%	100%	100%	100%	100%	100%

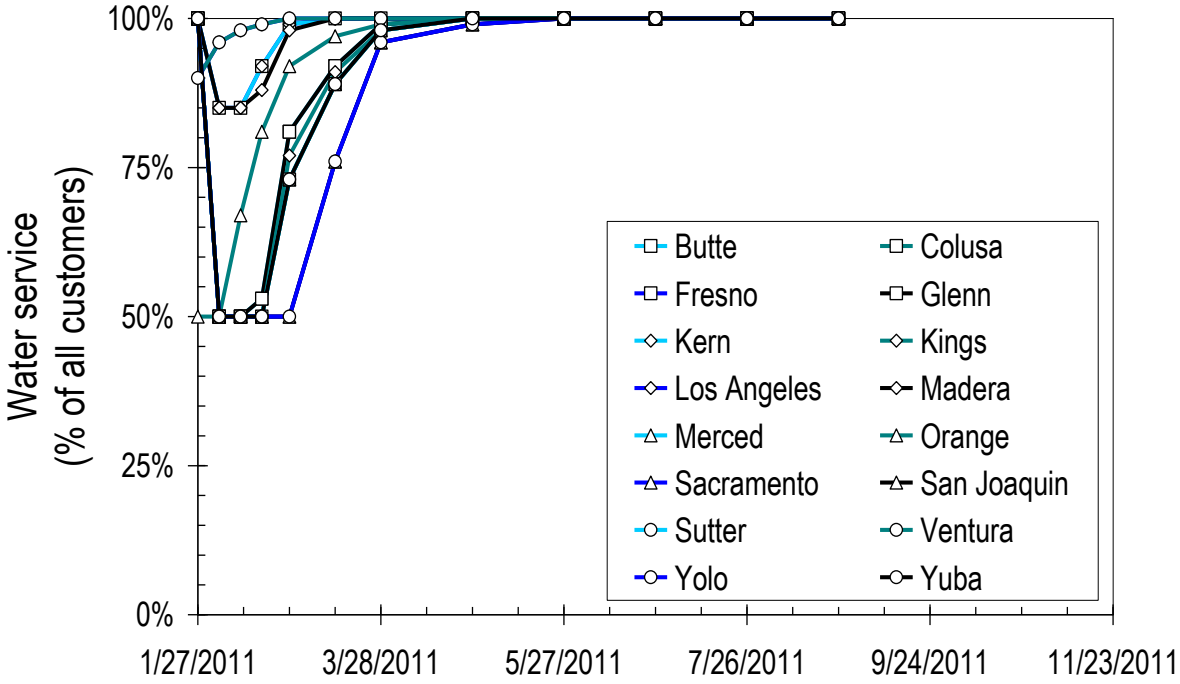

Figure 34. Scenario water service restoration per county, showing percentage of customers with service at different times.

LIFELINE INTERACTION INVOLVING WATER SUPPLY

As noted above, some water-supply pipelines are on roadway or railway bridges, so bridge damage or failure (from scour) could interrupt water transmission. Furthermore, treatment facilities isolated by roadway or rail damage or flooding can run out of chlorine; some facilities receive chlorine shipments every 3-4 days. Many water treatment plants (WTPs) have onsite emergency generators, often elevated above grade, typically with 3-4 day supply of fuel (if not running on piped natural gas). These WTPs are, therefore, somewhat resistant to offsite (utility) power failure. Pumps in wellfields, however, are generally not equipped with emergency generators, so water supply to communities that rely on ground water or on water that requires pumping may be susceptible to loss of water resulting from power failure.

ENHANCING RESILIENCY FOR WATER SUPPLY

Panelists recommended retrofitting facilities to make structures housing electrical equipment watertight, for example, with high berms or by elevating equipment. New equipment in new facilities could be elevated above grade, out of potential floodwaters. Another measure identified was to stockpile electrical equipment. This step would be problematic, since electrical systems at WTPs tend to be entirely custom designed. One panel suggested that more-critical facilities should be protected to higher standards than protection against 100-year flooding. Panelists also suggested that each water district should have programs to house, feed, or otherwise care for employees and their families, and know where the employees live.

As with other lifelines, panelists also suggested that water agencies work with FEMA to loosen requirements that public assistance grants provide reimbursement only for in-kind repairs. FEMA could reimburse for the cost of in-kind repairs, but allow that reimbursement to be applied to repairs that restore facilities to higher than pre-storm standards.

They also suggested more mutual-aid arrangements with better communication to speed recovery, and noted that water-supply systems could plan to stockpile water treatment chemicals in anticipation of severe storms to facilitate business continuity.

RESEARCH NEEDS FOR WATER SUPPLY

To perform a complete analysis of the damageability and resiliency of water supply would require a systems analysis. However, a system analysis would be impractical in part because there appears to be no central clearinghouse for much of the required data. Some of the basic data are difficult to acquire, such as the locations of WTPs, which appear in neither HSIP Gold 2007 database nor the Department of Water Resources (DWR) Water Data Library. Much of the available data is dispersed among various agencies and tends to be limited to location, owner, and various identifiers, and lacks basic information on capacity, equipment, flood protection, backup power, and other relevant attributes. Some of the locational data appears to exist, but is publically available only as images. A basic system analysis would require a single integrated geospatial database showing nodes such as reservoirs, pumps, treatment plants, and intertie valves, and links such as pipelines and aqueducts, and relevant structural and functional attributes. A thorough system analysis would require one to treat water supply in connection with all interacting lifelines (especially power, roads, and telecommunications). Civil engineers and others refer to such interconnected networks as a "system of systems;" ideally one would perform a system-of-systems analysis to estimate lifeline damage, interaction, and restoration, if the necessary system data could be compiled.

Dams

A map of the approximately 1500 dams in the state was previously shown in figure 32. The California Division of the Safety of Dams (DSOD) regulates about 1,250 of these dams. The ARkStorm scenario developers considered the possibility that the storm could damage some of these dams, and possibly result in downstream impacts. According to University of California at Davis Professor Jay Lund, 45 dam failures have occurred in California since 1883, the last failure in 1965. All occurred in dams built before 1950. The most deadly of these failures occurred in March 1928. The St. Francis Dam was a concrete gravity dam built between 1926 and 1927 about 40 miles northwest of Los Angeles, near the present city of Santa Clarita. On March 12, 1928, the dam catastrophically failed. The resulting flood killed between 425 and 450 people and led to State legislation for the creation of the world's first dam-safety program to protect people against loss of life and property from dam failure. Figure 35 shows the St. Francis Dam, circa 1926, and on March 13, 1928, shortly after catastrophic failure. The failure is not associated with a severe winter storm. Figure 36 illustrates a famous dam overtopping failure caused by a severe storm and neglect, the South Fork Dam near Johnstown, Pa., which failed on May 31, 1889, killing 2,209 people.

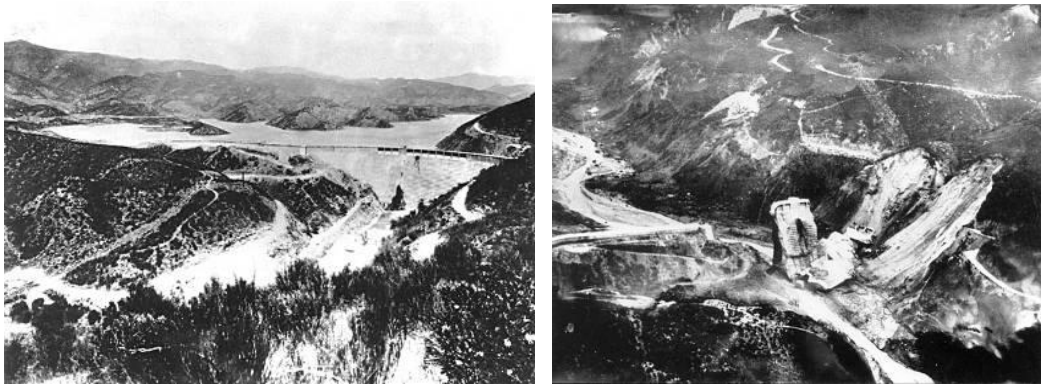

Figure 35. St. Francis Dam before (left) and after (right) collapse (both images: public domain).

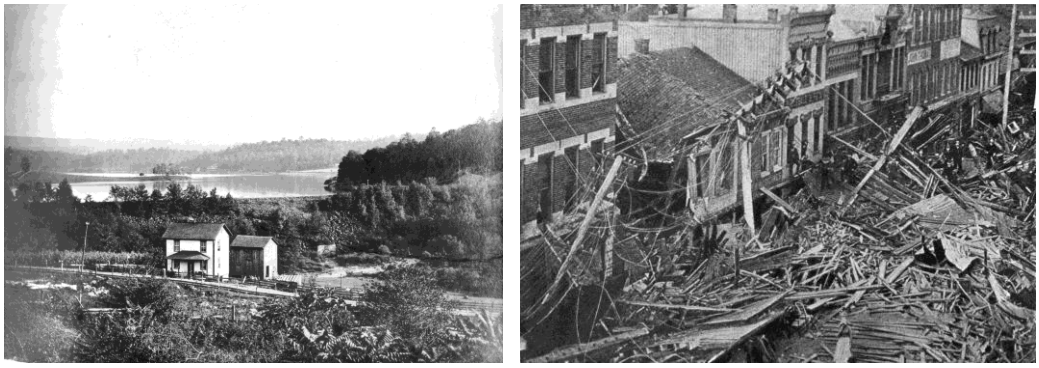

Figure 36. South Fork Dam near Johnsontown, Pa., (left, image courtesy of Johnstown Area Heritage Association) and aftermath of the May 31,1889, Johnstown flood (right, public domain image).

Less dramatic problems with dams in California have occurred. According to ARkStorm panelists, a small detention basin built in the 1930s or 1940s overtopped in a 2005 storm, then failed, and soil from the dam entered a covered reservoir. This dam is not under the regulation of DSOD. The result was damage to the cover and mud in the reservoir, which affected water quality. The reservoir had to be drained and cleaned, and the cover repaired. In another instance, a 1997 landslide near the Franklin Canyon Reservoir caused stormwater to be diverted onto the dam, which threatened but did not actually damage the dam. This dam also is not to be under the regulation of DSOD. In other instances, the 1997 and 1998 floods caused significant debris flows into reservoirs downstream of the upper watersheds, causing increased levels of sediment, some loss of storage capacity, and very significant levels of floating debris such as trees and storage tanks.

DAM DAMAGE SCENARIO

Controlled releases of large quantities of water from reservoirs could cause flooding in downstream creeks, channels, and floodplains. A DSOD panelist felt that, close to the reservoirs, this could cause minor spillway damage or erosion in downstream channels. A dam owner panelist felt that “minor spillway damage” may be an underestimate, saying "When spillways sit untested for

years, then are subjected to continuous flow for an extensive period, damage is possible or even likely." Panelists found it plausible that one or more events could occur in ARkStorm like the 1997 landslide near Franklin Canyon Reservoir or the 2005 detention-basin failure. They also found it plausible that in an extreme event such as the ARkStorm for a dam in the San Francisco Bay Area to experience spillway damage or downstream erosion. However, a DSOD panelist pointed out that DSOD requires all state-regulated dams to have spillways that can safely pass a specified design storm without overtopping. Design storm requirements are determined on a sliding scale. Smaller, low-hazard dams (those with minimal downstream consequences if they were to fail) are designed for 1,000-year storms. Larger, high-hazard dams that would produce extreme downstream consequences if they were to fail are designed for a probable maximum flood, determined in accordance with Hydrometeorological Report 36 (U.S. Weather Bureau, 1961) or more recently Hydrometeorological Reports 58 and 59 (U.S. Department of Commerce. 1998, 1999). Hydrology studies are periodically updated and spillways are enlarged for dams as DSOD judges necessary, particularly if the downstream consequences of failure change for a dam. ARkStorm produces runoff with local return periods between 10 and 5,000 years (fig. 5), which is generally less than the design capacity of the state-regulated dams. As part of DSOD's program, DSOD staff inspect all jurisdictional dams at least annually. A component of this inspection is to verify spillways are unobstructed and fully functional. The ARkStorm, therefore, does not posit any dam overtopping failure to DSOD regulated dams. Minor spillway damage and downstream erosion is plausible, however, as well as occurrences similar to detention-basin damage, or similar to the 1997 landslide near the Franklin Canyon reservoir. Because of the extremely sensitive nature of a dam-damage scenario, the selection of a particular dam to imagine as hypothetically damaged in such a way is left to emergency planners.

LIFELINE INTERACTION RELATED TO DAM DAMAGE

Release of large quantities of water from reservoirs through valves and spillways could damage roads and bridges, and any other lifelines such as water-supply pipelines or telecommunication cables carried on dams. Such lifeline interaction is hypothesized on one Bay Area highway.

Levees

The expert panel convened in Sacramento to discuss damages to levees for the ARkStorm scenario felt that urban levees might be threatened or overtopped at 60 to 75 critical sites, and that 15-20 breaches might realistically occur. The panel believed that 30 breaches of Delta levees were realistic, with 2-3 breaches occurring per island. The panel felt that a total of 50 levee breaches was realistic.

A scenario of levee breaches for the Sacramento-San Joaquin Delta (the Delta) in particular was developed by Jack R. Benjamin and Associates, Inc. Estimates of cost and time to repair levees and dewater islands also was provided. The analysis used the Emergency Response and Repair module developed for the Delta Risk Management Strategy project which evaluated the risk of levee failures and island flooding as a result of large inflows into the Delta (URS Corporation and Jack R. Benjamin & Associates, 2009).

THE DELTA LEVEE DAMAGE AND REPAIR SCENARIO

In the event that a major flood in the Delta, occurs, the number and specific islands that may experience a levee breach and flooding is potentially quite varied. Given the number of islands (referred to as analysis zones) in the Delta (fig. 37), there are many possible combinations of levee breach/island flooding sequences that could occur (involving varying numbers of islands and varying combinations of islands) for a given flood. In the Delta Risk Management Strategy project, thousands of levee breach/island flooding sequences were generated to model the randomness in levee response during floods.

In this study, a single levee breach/island flooding scenario was generated for the ARkStorm flooding. The characterization of the projected flooding in the Delta is not based on an event-specific hydrologic analysis. Rather, this characterization is a result of a general assessment based largely on the FEMA Digital Flood Insurance Rate Maps. As a result, the input to this assessment does not provide an event-specific characterization of the spatial distribution of flooding that might occur in the Delta during a major hydrologic event. Another input to this analysis was the projected number of flooded islands as a result of levee failure. It was understood that approximately half of the islands in the Delta could be breached and flooded as a result of levee failure.

The historic record of island flooding since 1900 was reviewed to generate a levee breach/island flooding scenario. Historically, there have been multiple events where 10 or more islands have flooded as a result of levee failures. Also, there are islands that have experienced levee breaches on multiple occasions during flood events. In addition to reviewing the historic record, the amount of levee overtopping that occurs for a projected 500-year Delta inflow was reviewed. Based on the historic experience and projected levee overtopping for a 500-year flood event, a list of islands that could experience levee failures was generated. In recognition of the randomness of individual flood events (e.g., all 500-year flood events are not the same) and levee performance, the scenario is simply one possible realization of the possible outcomes during a large flood.

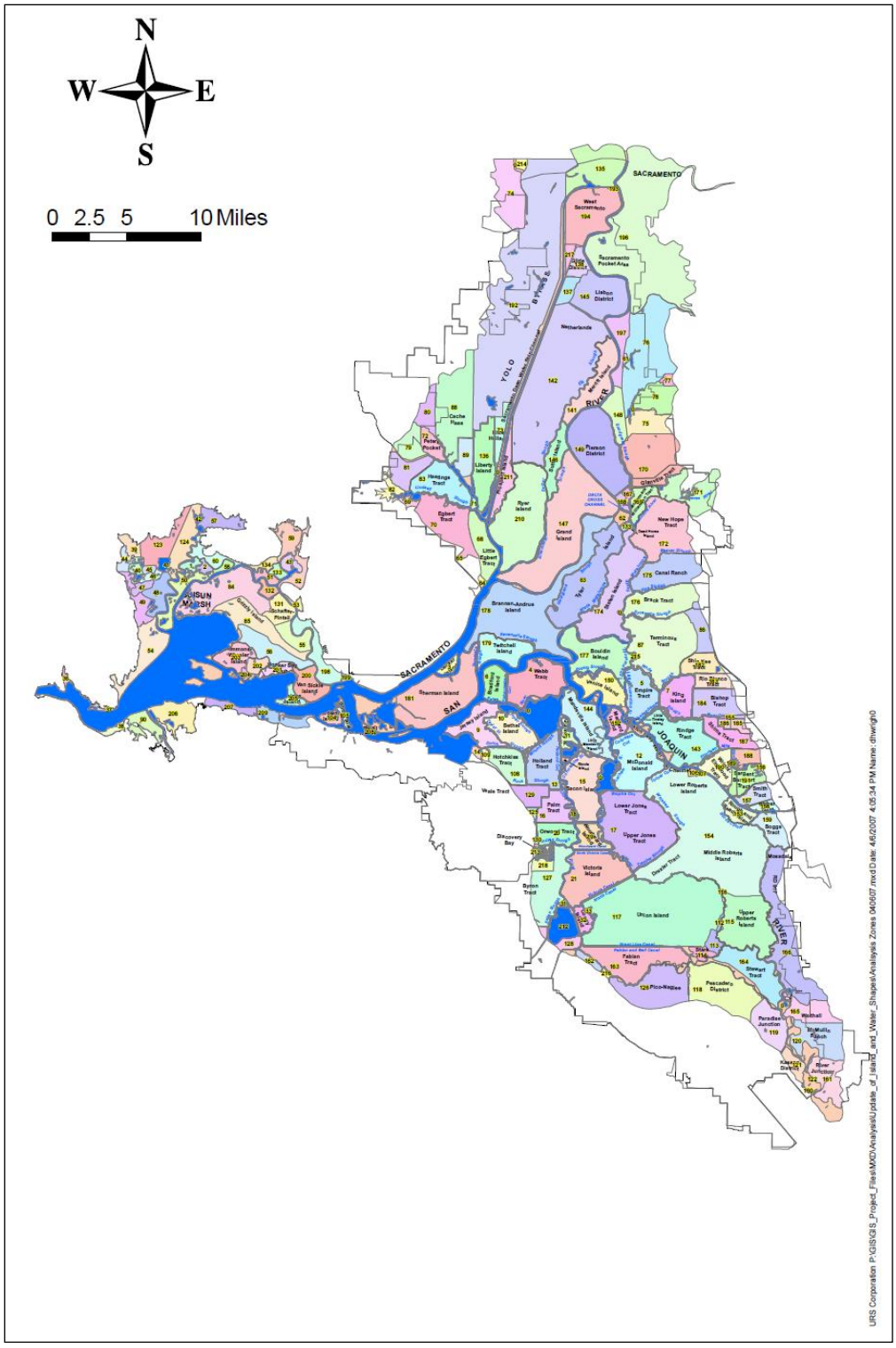

Figure 37. Sacramento-San Joaquin Delta levee analysis zones.

Flooded Islands

Table 5 lists the 31 flooded islands (analysis zones) for use in the ARkStorm scenario. In addition to these islands, 8 associated analysis zones are projected to be flooded. These are zones which have adjacent areas that are protected by interior levees (for example, Netherlands).

Repair Costs and Timing

Table 5 lists the time (in number of days after the flood) it takes for levee breaches to be repaired and islands to be dewatered. The repair and dewatering time estimates are based on assumptions for the Emergency Response and Repair module documented in URS Corporation and Jack R. Benjamin & Associates (2008). The primary repair time constraint is the supply production rate for the rock material. Dewatering immediately follows levee repairs and 42-inch pumps are assumed to operate at 80 percent capacity based on Jones Tract data.

Table 6 provides the cost of closing the levee breaches and dewatering flooded islands. The costs are $55per ton of material placed and $35 per acre-foot of water pumped (URS Corporation and Jack R. Benjamin & Associates, 2008). The total time to complete the breach closures and to dewater all islands also is given. Note that the costs in table 6 do not include the economic consequences associated with island cleanup, repair of damage to structures, replacement costs of structure contents, lost business revenue, and other costs. Values in table 5 and table 6 have been rounded to 2 significant figures.

Table 5. Dewatering time of flooded Delta islands and tracts.

No.	Island/Tract	Zone Identifier	Time to Dewater (Days)
1	Glanville	170	55
2	McCormack-Williamson Tract	169	54
3	Dead Horse	173	62
4	New Hope	172	140
5	Prospect	211	95
6	Tyler	62, 63	110, 200
7	Shima	187	140
8	McMullin Ranch	120	130
9	Paradise Junction	119	110
10	Pescadaro	118	140
11	River Junction	161	150
12	Medford	152	280
13	Netherlands	142, 137, 138, 145	340, 170, 180, 210
14	Sacramento Pocket Area	196	200
15	West Sacramento (North)	135	200
16	West Sacramento (South)	194	210
17	Sargent-Barnhart	191, 156	260, 230
18	Roberts (Upper, Lower, Middle)	115, 154	240, 360
19	Moore Tract 1	89	300
20	Moore Tract 3	88	290
21	Hastings Tract 2	83	320
22	Zone 148	148	320
23	Walthal	165	310
24	Ryer	210	430
25	Egbert Tract	70	410
26	Zone 171	171	370
27	Zone 76 - Elk Grove	76	380
28	Zone 75	75	380
29	Peter Pocket	72	370
30	Little Egbert	68	580
31	Elk Grove	61	430
32	Jones Tract - Upper and Lower	17	540
33	Shin Kee	182	450

Table 6. Summary of Delta island repair costs and times.

Item	Amount
Total Cost	$480,000,000
Total Repair Costs	$460,000,000
Cost for Island Dewatering	$20,000,000
Time to Close All Breaches (Days)	440
Time to Dewater All Islands (Days)	580
Volume of Rock (tons)	8,400,000

MITIGATION OF LEVEE FAILURE

The above analysis assumed that levees would be repaired and islands restored. A cost benefit approach to levee upgrades favors repair and restoration of islands and netherlands that are urbanized and/or contain highly valued assets. Suddeth and others (2010) apply decision analysis to the non-project Delta Island levees and posit that some of the island levees in table 5 may not qualify for an upgrade (for example, Deadhorse, Jones, Medford, Roberts, and Tyler Island levees) and, in the case of failure, levee repair costs for some islands may not be justified (for example, Deadhorse and Medford Islands). Another consideration is the criticalness of islands to water export quality (for example, Twitchell, Bradford, and Jersey Islands). Related to the protection of state water supply from high water flood flows and other threats (for example, sea level rise, earthquake, and subsidence) is the on-going preparation of the Bay Delta Conservation Plan to improve water-supply reliability and restore habitat. The Delta Habitat Conservation and Conveyance Program will conduct an environmental review of the Bay Delta Conservation Plan.

As a result of California Senate Bill 5 (Machado), the DWR is required to evaluate the current level of performance of the federal-state flood protection system in the Central Valley. The Urban and Non-Urban levee evaluations are appraising federal-state Project levees, including associated non-Project levees, to help flood managers understand the overall flood risks in the Central Valley and evaluate alternative changes to the flood management system (California Department of Water Resources, 2010b).

Panels in Pasadena, Sacramento, and Menlo Park agreed that during severe weather, the California Department of Water Resources focuses on keeping levees in place long enough to assure safe evacuation of the protected areas. (The objective is comparable to that which California building codes have historically held for the seismic resistance of buildings: that code-compliant buildings provide a reasonable degree of protection against life-threatening damage, not necessarily that the buildings should be earthquake proof. Therefore, the goals of DWR for levee protection and of the Uniform and International Building Codes for seismic resistance are to protect people, not necessarily to protect property.)

Telecommunications

One can extrapolate to ARkStorm from the performance of telecommunications in the Midwest flood of 1993, Katrina Hurricane 2005, and the northwest Pacific storm of 2007.

TELECOMMUNICATIONS ASSETS EXPOSED TO LOSS

We consider here the effect of the ARkStorm scenario storm on landline and cellular telecommunications systems. Tang (2010) gives details of this assessment. Landline refers here to the conventional telephone system often called POTS (Plain Old Telephone System).

Landline systems include buildings and the links between them. The buildings are where switching and data processing occurs, and include central offices, data centers, and remote offices. The buildings house telephone switching equipment (essentially computers, typically installed in metal racks); often microwave transceiver equipment; backup power systems (especially uninterruptible power supply—UPS—that is, batteries that can provide 8 hours or more of power for switching) and various other mechanical, electrical, and plumbing (MEP) equipment common to commercial buildings. The links in a landline system comprise fiber optic cable, copper cable, microwave transmission, and as addressed here, submarine cables that carry international voice and data connections.

Cellular systems (also called wireless) comprise base transceiver stations (BTSs, sometimes called cell sites), mobile telephone switching offices (MTSOs), the links connecting BTSs to MTSOs and BTSs to each other, the transmission network that connects the cellular equipment to the landline network. Most BTSs have less than 3 hours of battery reserve power (because of battery weight and limits to placing heavy equipment on rooftops where BTSs are often placed).

Telecommunications systems tend to be highly redundant. Links between central offices and remote switches are usually dispersed and often use both microwave and cable connections, so traffic through a damaged link can be routed through another, undamaged link. However, the distribution links via landlines to individual subscribers are usually not redundant, and are typically provided by a single copper cable line terminated at a pedestal (generally a metal box near the property line containing telephone switches or connections) with a cross-connect to the household (that is, a wire connecting the house to pedestal).

All major service providers in the U.S. have emergency response and restoration plans to further mitigate the potential for service interruption. These providers own mobile units of self contained switching equipment and cellular equipment with a quick physical connection capability to the interoffice connection terminals. The mobile switching office is called switching on wheels, (SOW), and the mobile BTS is called cell on wheels; (COW); these mobile units are illustrated in figure 38. Although these units do not have the same capacity as the damaged sites, these units are able to provide emergency service to allow 911, police, fire fighting, and medical services to access the telecommunication circuit. In California, many central offices and remote offices are upgraded with external quick power connection terminals. This connection allows the service crew to quickly connect external power source such as mobile power generator set to power the equipment without having to enter the building. For BTSs this feature is not usually available unless it is a big site.

Figure 38. Switch on wheels (left) and cellular on wheels (right) (Photograph taken by A. Tang, L & T Consulting).

MECHANISMS FOR TELECOMMUNICATIONS SERVICE INTERRUPTION

Telecommunications networks are susceptible to slowing or even being blocked when overloaded by call volume. California systems are capable of handling the common level of usage in the area (referred to as traffic pattern and dwell time). When a disaster strikes and people call each other to check on their safety and so on, the systems get overloaded and it can be difficult to get a dial tone. Also, extended power failure can exhaust UPS capacity and cause service interruption. These two mechanisms for service interruption do not require physical damage to telecommunications equipment or facilities.

Many of the components of the telecommunication system are susceptible to physical damage in a severe storm, damage that can slow or interrupt voice or data service. Some of the mechanisms of storm damage are: flooded manholes, toppled poles, misaligned microwave dishes, severed cables, inundated buildings, and damaged antennas. Two of these damage modes are illustrated in figure 39, which contains images from Hurricane Katrina. In one, wind damage to rooftop equipment interrupted microwave communications. In the other, flooding to the central office ground floor damaged power equipment and other central office components. (Many power systems of central offices are installed in the lower part of the building because of the weight of the power equipment. A flooded power room will shut down the facility.) Similar damage has been observed in other storms, such as the December 2007 storm in the Pacific Northwest.

Soil failure and flooding also can damage cables. For example, in the same 2007 Pacific Northwest storm, an optical fiber cable was damaged by soil failure and a number of fibers were severed. The result was 3 days of internet congestion between Australia, New Zealand, and North America. Figure 40 shows damage to fiber optic cable. In one, water in a flooded utility tunnel entered fiber optic cable at a splice, causing signal degradation and transmission capacity reduction. In the other, cable laid along a railbed was damaged when the railbed washed out.

Figure 39. Microwave dish blown off the tower mount (left); flooded central office (right). (Kwasinski, 2006; public domain images)

Figure 40. Damage to fiber optic cables: flooding degraded transmission when water leaked into a splice (left); ground failure damaged a cable laid along a railbed that washed out (right).

TELECOMMUNICATIONS SERVICE RESTORATION SCENARIO

With these considerations in mind, we estimated the service restoration times shown in table 7 (for landlines and internet service) and table 8 (for cellular service). The direct loss to service providers is estimated to be on the order of $100 million, including costs of material, logistics, and technical personnel.

The table's first column contains the county's name, the second its FIPS code. The column labeled peril denotes whether wind (W) or flood (F) dominates the cause of telecommunication service failure to customers. Column 4, labeled C0, denotes the estimated percentage of customers initially without telephone service after the storm. The remaining columns reflect the estimated percentage of customers able to receive power that do have power service, by date.

Table 7. Landline and internet network restoration showing percentage of customers with power service by date. The estimates are based on post earthquake and hurricane recovery data.
[FIPS, Federal Information Processing Standard; W, wind; F, flood; C_0, percentage of customers initially without power after the storm; %, percent]

County	FIPS	Peril	C_0	1/27/11	2/3/11	2/10/11	2/17/11	2/26/11	3/13/11	3/28/11	4/27/11	5/27/11	6/26/11	7/26/11	8/25/11	9/24/11
Alameda	6001	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Alpine	6003	W	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Amador	6005	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Butte	6007	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Calaveras	6009	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Colusa	6011	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Contra Cos	6013	F	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Del Norte	6015	F	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
El Dorado	6017	W	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Fresno	6019	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Glenn	6021	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Humboldt	6023	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Imperial	6025	F	15%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Inyo	6027	W	15%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Kern	6029	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Kings	6031	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Lake	6033	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Lassen	6035	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Los Angel.	6037	F	20%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Madera	6039	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Marin	6041	F	20%	100%	100%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mariposa	6043	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mendocino	6045	F	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Merced	6047	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Modoc	6049	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mono	6051	W	15%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Monterey	6053	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Napa	6055	F	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Nevada	6057	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Orange	6059	F	20%	79%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Placer	6061	W	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Plumas	6063	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Riverside	6065	W	20%	79%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
S Francisco	6075	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
S Joaquin	6077	F	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
S L Obispo	6079	W	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
S. Bernard.	6071	W	20%	79%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sacramento	6067	F	20%	100%	100%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Benito	6069	W	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Diego	6073	F	20%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Mateo	6081	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Clara	6085	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Cruz	6087	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Shasta	6089	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sierra	6091	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Siskiyou	6093	W	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Solano	6095	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sonoma	6097	F	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sta Barbara	6083	F	15%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Stanislaus	6099	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sutter	6101	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tehama	6103	W	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Trinity	6105	W	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tulare	6107	W	10%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tuolumne	6109	W	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Ventura	6111	F	20%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Yolo	6113	F	2%	100%	100%	98%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Yuba	6115	F	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 8. Cellular network restoration showing percentage of customers with power service by date. The estimates are based on post earthquake and hurricane recovery data.
[FIPS, Federal Information Processing Standard; W, wind; F, flood; C_0, percentage of customers initially without power after the storm; %, percent]

County	FIPS	Peril	C_0	1/27/11	2/3/11	2/10/11	2/17/11	2/26/11	3/13/11	3/28/11	4/27/11	5/27/11	6/26/11	7/26/11	8/25/11	9/24/11
Alameda	06001	W	2%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Alpine	06003	W	15%	100%	100%	81%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Amador	06005	W	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Butte	06007	W	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Calaveras	06009	W	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Colusa	06011	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Contra Cos	06013	F	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Del Norte	06015	F	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
El Dorado	06017	W	20%	100%	100%	61%	93%	99%	100%	100%	100%	100%	100%	100%	100%	100%
Fresno	06019	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Glenn	06021	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Humboldt	06023	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Imperial	06025	F	15%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Inyo	06027	W	15%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Kern	06029	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Kings	06031	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Lake	06033	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Lassen	06035	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Los Angel.	06037	F	20%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Madera	06039	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Marin	06041	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mariposa	06043	W	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mendocino	06045	F	20%	100%	100%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Merced	06047	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Modoc	06049	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mono	06051	W	20%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Monterey	06053	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Napa	06055	F	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Nevada	06057	F	15%	100%	100%	85%	100%	199%	100%	100%	100%	100%	100%	100%	100%	100%
Orange	06059	F	25%	75%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Placer	06061	W	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Plumas	06063	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Riverside	06065	W	15%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
S Francisco	06075	F	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
S Joaquin	06077	F	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
S L Obispo	06079	W	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
S. Bernard.	06071	W	10%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sacramento	06067	F	20%	100%	100%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Benito	06069	W	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Diego	06073	F	15%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
San Mateo	06081	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Clara	06085	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Santa Cruz	06087	F	15%	100%	100%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Shasta	06089	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sierra	06091	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Siskiyou	06093	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Solano	06095	F	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sonoma	06097	F	10%	100%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sta Barbara	06083	F	15%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Stanislaus	06099	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Sutter	06101	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tehama	06103	W	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Trinity	06105	W	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tulare	06107	W	5%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Tuolumne	06109	W	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Ventura	06111	F	15%	85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Yolo	06113	F	5%	100%	100%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Yuba	06115	F	3%	100%	100%	97%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

LIFELINE INTERACTION INVOLVING TELECOMMUNICATIONS

Telecommunications recovery can be limited by restoration of roads, bridges, and power. The most important among the three is electric power, because the equipment does not operate without power and backup power is limited, particularly BTSs with their 3 hours or less of battery power.

Loss of telecommunications hinders restoration of other lifelines such as water and wastewater because the lifelines can rely on cellular phones to dispatch and coordinate service calls. This scenario happened in the moment magnitude scale (Mw) 8.8 earthquake in Chile on February 27, 2010. According to a district director of civil defense in Cauquenes, Chile, it took 5 days, to restore cellphone service in that city, during which time firefighters were the only ones able to communicate other than in person, because they had battery-powered portable radios. Restoration of electric power, highway, water, wastewater, and some emergency services throughout the affected area were hindered by telecommunications service disruption during the first several days after the earthquake.

It is very common for collateral damage to occur to telecommunications cables because of damage to bridges on which the cables are collocated.

OPPORTUNITIES TO ENHANCE TELECOMMUNICATIONS RESILIENCY

Telecommunications resiliency could potentially be enhanced by the following means:

1. Install redundant, links that are not co-located and do this between all nodes (central offices, BTSs, and MTSOs) with different technology.
2. Improve flood containment for manholes, central offices, BTSs, and MTSOs in the flood prone areas, or locate equipment above the expected flood level.
3. Increase battery reserves to at least 8 hours for all BTSs.
4. Install backup generators with at least 2 days of fuel above expected flood levels for difficult-to-access sites (remote central offices and BTSs).
5. Use separate radios systems for emergency service dispatching and coordination.
6. Locate spare parts and components storage facilities within reasonable distance for groups of nodes.
7. Harden storage facilities of spare parts and components.
8. Participate in Government Emergency Telecommunications Services (GETS) and other federal initiatives on mitigation and emergency response.
9. Establish an overall service restoration interval and use voice and text messaging and internet services to reduce general anxiety after a disaster.

Agricultural Damages and Losses

Agricultural damages and losses during winter storms result from precipitation-runoff flooding, coastal flooding, strong winds, and landslides. The ARkStorm coastal process analysis suggests that some agricultural land in the wide, flat alluvial Santa Clara River plain of Ventura County may be vulnerable to coastal flooding. A spatial analysis of ARkStorm windspeeds above 50 mph indicated negligible potential for wind damage to orchards across the state of California. Although, mudslides reportedly caused $1 million (1969 dollars) of agricultural losses in Los Angeles County, during the 1969 storm (Malnik, 1969), an analysis of agricultural damages from landslides was not attempted for the ARkStorm scenario. However, the extent of ArkStorm

precipitation-runoff flooding would be the overwhelming cause of damages to the agricultural sector.

To analyze the agricultural damages from flooding, an historic perspective on agricultural damages from California storms was gleaned from newspaper and agency reports to provide the context for the estimation of agricultural damages from ARkStorm flooding. The analysis, conducted by David Mitchell (M-Cubed), produced statewide and county estimates of agricultural damages and losses to annual and perennial crops and of livestock at risk. The types of losses include field restoration costs, crop and livestock replacement costs, and forgone income.

HISTORIC AGRICULTURAL DAMAGES FROM CALIFORNIA FLOODS

Floods have damaged agricultural systems for hundreds of years in California (fig. 41). Newspaper reports of the 1861-62 storm present the agricultural damages and losses as:

- Unprecedented losses of livestock described as swimming, swept away, drowning, floating, or starving (Daily Alta California,1861, 1862a, 1862b, 1862c, and Los Angeles Star, 1862a)
- Grain and potato crop losses (Daily Alta California, 1862b, 1862e)
- Grape vines, pasture, and orchard lands washed away and fruit trees uprooted (Los Angeles Star, 1862b, 1862c)
- Farming tool losses (Daily Alta California, 1862f)
- Farmland covered in a thick layer of sand destroying hopes of vegetation for some time (Daily Alta California, 1862g)

Figure 41. Early flooding along a levee (photograph taken by National Oceanic and Atmospheric Administration, date and location unknown).

A more recent damaging storm to the Californian agricultural sector occurred in 1997 when nearly 300 square miles of flooded agricultural land caused losses to 30 agricultural commodities in

more than 30 counties (California Department of Water Resources, 1997). The Flood Emergency Action Team (FEAT) final report (California Department of Water Resources, 1997) lists the economic losses as:

- Crop losses totaled $107 million, with the largest losses being walnuts, wine grapes, winter wheat, and alfalfa.
- Crop damage costs added another $49 million, with peaches, plums/prunes, wine grapes, and walnuts incurring the largest damage.
- Damage to nurseries totaled $16 million
- Livestock costs were another $12 million
- Damages to farm infrastructure (irrigation systems, roads, buildings, and fences) totaled $109 million.

The most severely affected counties were Butte, Yuba, Stanislaus, Nevada, Sacramento, San Joaquin, and Sutter.

To summarize, five categories of agricultural damages can be identified from these reports: damages to annual crops, perennial crops (fig. 42), livestock, fields, and equipment. While flooding is the primary cause of these damages, reports on the 1986 storm (San Francisco Chronicle 8 Mar 1986) indicate agricultural damages and losses are further exacerbated by:

- Bacterial diseases
- Delays in pollination and maturity
- Delays from pumping out agricultural fields.

For the ARkStorm scenario, we estimated field repair costs (that include costs of repair to roads, culverts, and irrigation systems), perennial and livestock replacement costs, and forgone annual and perennial crop income losses. Flood damage to agricultural building stock and contents (presumably including equipment and feed) was estimated at about $13 billion by using HAZUS-MH inventory and methodology. We were unable to consider the effects of bacterial diseases and delayed pollination. We were able to address the effects of further agricultural production delays resulting from the time to repair Delta levees and dewater islands.

Figure 42. Flooded vineyards, Guerneville, Calif., 2006, because of Russian River flooding (Photograph by A. Dubrowa for Federal Emergency Management Agency).

METHODOLOGY

ARkStorm agricultural damages and losses from flooding were estimated for the following commodity categories:

- Annual crops
- Oilseeds – which include seed crops such as sunflower.
- Grains – which include wheat, barley, rice and other grains.
- Vegetables and Melons
- Fruits – which include strawberries and other annual fruit crops
- Sugar Beets
- All other annual crops, which include other forage and field crops
- Perennial crops
- Fruit trees – which include orchards and vineyards
- Greenhouse and nursery – which include nursery stock, Christmas tree farms, and other greenhouse crops[1]
- Tree nuts - which include almonds, walnuts, pistachios, and other tree nuts

[1] Greenhouse and nursery crops were included under perennial crops for simplicity.

- All other perennial crops
- Livestock operations
- Dairy
- Feedlot cattle
- Poultry

Livestock damages pertain to livestock confined to feedlots, dairy farms, and poultry operations; we did not address potential losses of open range livestock.

The following data and methodologies were used to overlay agricultural commodity production on the flood map, calculate field repair and cleanup costs, and estimate agricultural damages.

Location, Extent, Depth, and Duration of Flooded Agricultural Land

DWR land-use survey data[2] provided the spatial distribution of commodity production in 33 counties. The data specified one agricultural commodity for each area even if the commodity could be one of multiple crop types. GIS techniques were used to intersect acres of commodity production with the ARkStorm flood map attributes to produce the following information by county:

- Total amount of county acreage by agricultural land use (for example. orchard, forage, feedlot)
- Amount of county acreage by agricultural land use inundated under the ARkStorm flood scenario
- Range of flood depth (in feet) and flood depth at midpoint of depth range by agricultural land use
- Range of flood duration (in days) by agricultural land

Flood depth was set to the midpoint of the depth range for each land use class in a county. Low, mid-, and high flood durations were considered.

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[2] DWR land use surveys are done on a rotating basis. The survey data used for this study covered the period 1993 to 2006. These land use surveys were performed by using aerial photographs and, more recently, satellite imagery to define field boundaries. Most of the land use survey data are entered directly into a digital map by using geographic information system (GIS) software on a laptop computer. Georeferenced, orthorectified imagery is used as a backdrop, and the land use boundaries are visible on top of the imagery. DWR staff visit and visually identify land uses on over 95 percent of the developed agricultural areas within each survey area. After the field work has been completed and the maps have been checked for errors, a digital composite map of the survey area is created from the work of individual surveyors. Using GIS software, digital maps of quads, counties, water districts, and the DWR hydrologic planning units (Detailed Analysis Units) can be overlaid on the land use data to develop acreage summaries of land use by areas. Digitized land use survey data used for this study were downloaded at www.water.ca.gov/landwateruse/lusrvymain.cfm.

Field Cleanup and Repair Costs

Floods may impact farmland by causing erosion and deposition of debris and sediment, damaging farm roads, and clogging drainage and irrigation ditches. Damages are likely to be highly variable, depending on the velocity of flood flows, as well as depth and duration of inundation. Field cleanup and repair costs used for this study are based on average per acre costs for cleanup and rehabilitation used by the U.S. Army Corps of Engineers (USACE) in the 2002 "Sacramento and San Joaquin River Basin Comprehensive Study" (U.S. Army Corps of Engineers, 2002). Costs were assumed to vary according to flood depth and duration as shown in table 9. Costs were updated to 2009 dollars.

Table 9. Field cleanup and repair cost assumptions.
[%, percent; USACE, U.S. Army Corps of Engineers; ft, foot; >, greater than]

	Applied % of USACE Estimate				
	Flood Duration (Days)				
Flood Depth (ft)	0-0.25	0.25-1.75	1.75-3	3-5	>5
0-2	0%	25%	50%	75%	100%
2-6	0%	50%	75%	100%	100%
>6	0%	100%	100%	100%	100%
	$/Acre Cost				
0-2	$0	$79	$157	$236	$314
2-6	$0	$157	$236	$314	$314
>6	$0	$314	$314	$314	$314

Damages to Annual Crops

Flooding of agricultural land can disrupt field preparation and planting, destroy crops in the ground, and disrupt or prevent harvesting. The extent and severity of impact depends on the season in which flooding occurs, the duration of inundation, and the type of crops inundated. Losses from spring and summer floods generally will be greater than from autumn and winter floods. Brief periods of inundation may result in only small damages if these floods occur after harvest and prior to spring planting. Longer periods of inundation occurring in the autumn and winter may prevent spring planting altogether. Spring and summer flooding, regardless of the duration of inundation, will destroy most field and row crops in the ground.

For this study, production losses for annual crops are based on the crop production loss models developed for the Delta Risk Management Strategy Phase 1 Report (California Department of Water Resources, 2008). The crop loss values in this model were calculated by using Delta crop revenue and cost estimates prepared by DWR and monthly distributions of crop production costs

and revenues developed for the Sacramento and San Joaquin River Basins Comprehensive Study (California Department of Water Resources, 2005 U.S. Army Corps of Engineers, 2002). The model calculates the difference between lost harvest revenue and avoided production expenses as a function of the month in which a flood is assumed to occur. For this study, flooding was assumed to occur primarily in February.[3] In addition, the models make the following assumptions about crops in the ground and planting of crops for next season:

- Three months is required following dewatering for cleanup and rehabilitation before fields can be prepared for planting.[4]
- Spring/summer crops will not be planted if a field has not been dewatered and repaired by the end of March.
- Flooding occurring in January and February will destroy winter grain crops.

Given the above assumptions about lead times required for dewatering and field cleanup and rehabilitation, the ARkStorm flood scenario was assumed to disrupt the planting of truck crops and processing tomato crops, and winter grain crops, but not the planting or harvest of rice, corn, and other field crops. Average losses in 2009 constant dollars for flooded processing tomato and truck crop acreage are $424 and $1,479 per acre, respectively. The average loss for winter grain crops is $285 per acre. Crop income losses and field repair costs are assumed to be incurred in the same six-month period in which the flood occurs.

Damages to Perennial Crops

Prolonged inundation may result in extensive damage or death of permanent orchard, vineyard and hay crops. Damages result largely from anaerobic soil conditions. In addition anoxic conditions in the soil can lead to the release of toxic substances such as manganese. A review of the literature provided limited information on the effects of prolonged inundation on various crop types (California Department of Water Resources, 2008).

For this study, production losses for perennial crops are based on the crop production loss models developed for the Delta Risk Management Strategy (California Department of Water Resources, 2005). These models assume that perennial crops inundated for 14 days or more would be killed by anaerobic soil conditions caused by standing water. Estimated damages are equal to the replacement cost of the crop plus the foregone production net income from crop production during the period of crop reestablishment. Damages are calculated in six-month increments. We assume field repair costs are incurred in the first six months; crop reestablishment costs are incurred in the six month period following the flood in which the crop would typically be planted; and net crop income losses are incurred in the six monthly periods following the flood in which the crop would typically be harvested.

Orchard crops are assumed to have an average reestablishment cost of $9,100 per acre and to require 4 years to reestablish. Annual net crop income loss is assumed to average $3,900 per

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[3] Under the ARkStorm scenario flooding commences in middle to late January in northern California and early February in Southern California. February damage estimates from the crop models were considered to be most representative.

[4] This assumption is based on the experience with Jones Tract in the Sacramento/San Joaquin Delta.

acre in the flood year and $2,600 per acre thereafter.[5] Vineyard crops are assumed to have an average reestablishment cost of $11,400 per acre and to require 3 years to reestablish. Annual net crop income loss is assumed to average $3,700 per acre in the flood year and $3,400 per acre thereafter. Forage crops (primarily alfalfa) are assumed to have an average reestablishment cost of $640 per acre and to require 1 year to reestablish. Annual net crop income loss is assumed to average $530 per acre.

Damages to Livestock

Damages to livestock confined to feedlots, dairy farms, and poultry operations are based on the replacement cost of livestock at risk of death by drowning. The replacement costs estimation assume the livestock are lost, though some producers may be able to mitigate losses by temporarily relocating some or all of their stock. Livestock inventory and replacement cost estimates are taken from U.S. Department of Agriculture (USDA) Livestock Review reports for California. Livestock inventories were allocated across counties in proportion to each county's share of statewide feedlot, dairy, and poultry farm acreage, which was determined from the DWR land use survey data.

Flood depths of 6 feet or greater were assumed to place feedlot, dairy, and poultry livestock at substantial risk of death by drowning.[6] The number of head at risk was calculated by multiplying the fraction of feedlot, dairy, and poultry farm acreage in each county with a flood depth of 6 feet or greater by the county livestock inventory. This calculation yielded the estimated number of livestock potentially at risk under the ARkStorm flood scenario.

The value at risk is calculated by multiplying the number of livestock potentially at risk by the replacement cost per head. The average replacement cost for feedlot cattle is based on the inventory of cows, heifers, steers, and calves and the respective value per head. The average value used in this study is $678 per head.[7] Replacement costs for dairy cows and poultry come directly from USDA. Dairy cow replacement cost used in this study is $1,300 per head. Poultry replacement cost is $2.60 per head. Both estimates are based on 2009 prices received by California farmers. Livestock replacement and field repair costs are assumed to be incurred in the same six-month period in which the flood occurs.

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[5] The higher net income loss in the flood year is because of production costs incurred prior to the flood event. In subsequent years these production costs can be avoided.

[6] The rationale for a flood depth threshold of 6 feet is that livestock operators would have more opportunity to move livestock to safe ground or let livestock wait out the flood at lesser depths; whereas, depths of 6 feet or more would likely pose an existential threat to most livestock and likely would entail mandatory evacuations, which would limit the ability of operators to move livestock to safe ground.

[7] This is based on 2008 marketing year prices reported by USDA.

ARkSTORM AGRICULTURAL DAMAGE ESTIMATES

Damaged Land

Damaged lands were defined in relation to the following damage parameters: any flooding of annual crop land was assumed to result in damage to crops already in the ground; damage to perennial crop production is assumed in areas where flood waters do not recede for 14 or more days; and significant damage to livestock production is assumed in areas where flood depth is 6 feet or more.

The percent of land area in annual crops, perennial crops, and livestock production significantly damaged by flooding is summarized in table 10. Overall, the ARkStorm flood scenario results in significant damage to about 23 percent of acreage in annual crop, 5 percent of dairy, feedlot, and poultry livestock production, and 5 percent of perennial crop production. Comparable results by county and commodity category are available in appendix A. The percent damage varies greatly by county, with counties in the northern part of the San Joaquin Valley and southern part of the Sacramento Valley experiencing the most damage. Areas within the San Joaquin-Sacramento Delta are especially vulnerable to damage.

Table 10. Acres of significantly damaged agricultural lands. Values pertain to flooded annual crop lands, perennial crop lands with more than 14 days of flooding, and livestock areas with flood depth greater than 6 feet.

[%, percent]

Commodity	Acres production (thousands)	Acres significant damage (thousands)	Percent
Annual crop	18,582	4,324	23%
Perennial crop	5,673	261	5%
Livestock	285	13	5%

Statewide Agricultural Damages

Economic losses accrue from costs of field cleanup, and repair; perennial crop and livestock replacement; and forgone annual and perennial crop income. In the case of annual crops, foregone crop income is the difference between the harvest value of the crops destroyed and avoided production expenses. In the case of perennial crops (orchards and vineyards), foregone crop income is the sum of net crop income losses during the period of crop re-establishment. Figure 43 presents the estimated state losses of $3.75 billion (2009 constant dollars) for the low-end flood duration. Although there is 16 times more significantly damaged annual crop land than significantly damaged perennial crop land, most of the losses pertain to perennial crops for two reasons: reestablishment of these crops incurs replacement costs and multiple years of forgone income until the crop bears fruit. The high-end flood duration estimate increases annual, perennial, and livestock losses by 25 percent, 100 percent, and 1 percent, respectively, revealing the sensitivity of perennial crops to longer flood durations.

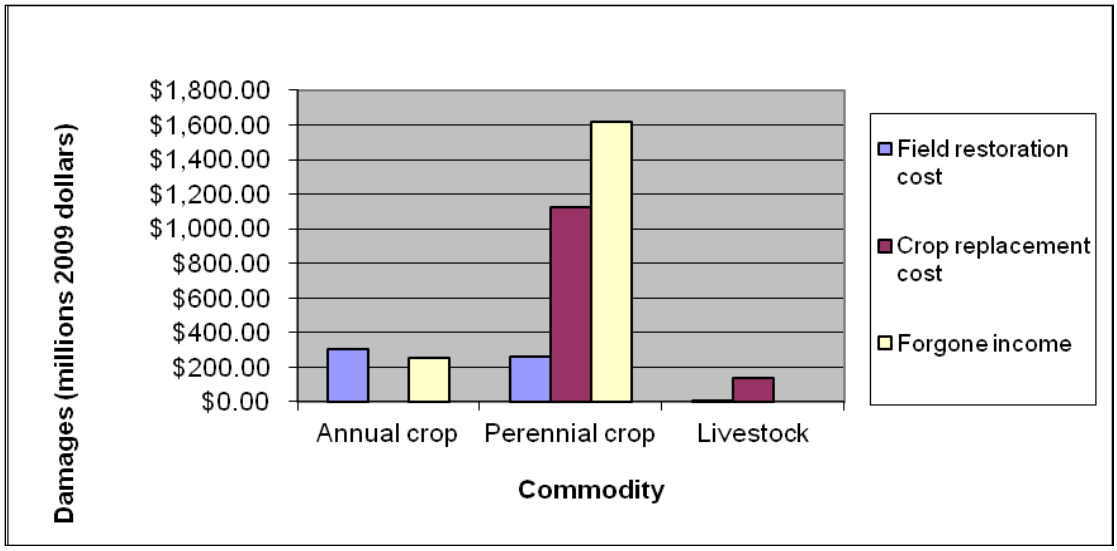

Figure 43. State agricultural damages to annual and perennial crops and livestock.

Table 11 through table 13 display the statewide damages by commodity category under annual and perennial crops and livestock for the low, mid-, and high flood durations. For the annual crops (table 11), about 50 percent of the losses pertain to grains and 25 percent to vegetables and melons. For the perennial crops (table 12), the damages are dominated by fruit tree damages; fruit tree (including vineyard) damages represent about 65 percent of the perennial crop damages. Damages to nut trees comprise about 25 percent of total damages to perennial crops and damages to forage crops (alfalfa) and nursery crops about 10 percent. Damages to perennial crops are spread over a 5-year reestablishment period, with about 70 percent of the total occurring in the first two years and 30 percent in the 3 subsequent years. The first two years of damages primarily are because of field damage and reestablishment costs while damages in the latter three years accrue from forgone crop income during the nonbearing period of reestablished orchards and vineyards. Differences in crop income losses across low, mid, and high flood duration occur when the flood duration causes further damage as is the case for perennial crop damage that is sensitive to greater than 14 days of flooding. For the livestock damages (table 13), just over 80 percent of the livestock replacement costs apply to dairy because the cost per head of dairy is twice that of feedlot herd and more dairy lands are significantly damaged.

Table 11 Statewide damages to annual crops for low, mid and high flood durations. All amounts are in millions of 2009 dollars.

[low, mid, high are flood duration designations]

Crop Category	Crop Income Losses			Field Damages			Total Damages		
	Low	Mid-	High	Low	Mid-	High	Low	Mid-	High
All Other Crops	$0.0	$0.0	$0.0	$56.7	$79.0	$92.2	$56.7	$79.0	$92.2
Fruits	$52.5	$53.0	$53.0	$30.1	$37.0	$38.9	$82.6	$90.0	$91.9
Grains	$85.3	$85.3	$85.3	$188.5	$244.7	$253.0	$273.8	$330.0	$338.3
Oilseeds	$0.0	$0.0	$0.0	$2.3	$3.1	$3.1	$2.3	$3.1	$3.1
Sugar Beets	$0.0	$0.0	$0.0	$4.6	$5.3	$5.7	$4.6	$5.3	$5.7
Veg/Melon	$110.9	$129.4	$129.4	$20.4	$25.6	$26.9	$131.4	$155.0	$156.3
Total	$248.7	$267.7	$267.7	$302.6	$394.7	$419.8	$551.3	$662.4	$687.5

Table 12. Statewide damages to perennial crops over 5-year reestablishment. All amounts are in millions of 2009 dollars.

[low, mid, high are flood duration designations]

Crop Category	Crop income losses			Field damages and crop replacement cost			Total Damages		
	Low	Mid-	High	Low	Mid-	High	Low	Mid-	High
Fruit Trees	$1,061.8	$1,061.8	$2,095.9	$871.2	$888.6	$1,591.0	$1,933.0	$1,950.4	$3,686.9
Nut Trees	$464.7	$464.7	$1,274.6	$327.3	$340.2	$858.0	$791.9	$804.9	$2,132.6
Peren. Forage	$79.8	$79.8	$136.1	$179.6	$214.0	$288.2	$259.5	$293.8	$424.3
Greenhouse	$9.4	$9.4	$19.3	$7.3	$7.9	$14.3	$16.7	$17.3	$33.6
Total	$1,615.7	$1,615.7	$3,525.9	$1,385.4	$1,450.7	$2,751.5	$3,001.0	$3,066.3	$6,277.4

Table 13. Statewide damages to livestock. All amounts are in millions of 2009 dollars.
[low, mid, high are flood duration designations]

Livestock Category*	Livestock Losses			Field Damages**			Total Damages		
	Low	Mid-	High	Low	Mid-	High	Low	Mid-	High
Dairies	$110.6	$110.6	$110.6	$1.5	$2.3	$2.4	$112.1	$112.9	$113.0
Feedlots	$22.2	$22.2	$22.2	$0.2	$0.4	$0.4	$22.4	$22.6	$22.6
Poultry	$1.3	$1.3	$1.3	$0.4	$0.6	$0.7	$1.6	$1.9	$2.0
Total	$134.1	$134.1	$134.1	$2.0	$3.2	$3.5	$136.1	$137.3	$137.6

* Does not include possible damages to free range livestock.

**Does not include damages to structures (for example, barns) or contents of structures (for example, milking equipment).

County Agricultural Damages

County results of annual and perennial crop and livestock losses were mapped for the first year and subsequent years (fig. 44 through fig. 47). The losses extend beyond the first year for perennial crops only. In the case of perennial crops, field repair costs are assumed to occur in the first six months, but crop income losses and reestablishment costs extend into the future, depending on the season in which the crop typically would be reestablished and the number of years until the crop would be bearing. The maps show the variation of losses across counties and the distribution of losses to commodities. About $140 million of the annual crop losses (about one third of the total for annual crops) occur in San Joaquin County followed by $55 million of annual crop losses in Kings County. San Joaquin County incurs about half of the perennial crop damages, followed by Sacramento and Yolo Counties. For livestock damages, again, the damages are concentrated in San Joaquin with almost half of the livestock damages. In contrast to crops, southern California counties are relatively more affected by livestock damages with $22 million in Riverside County and $13 million in San Diego County for replacement of dairy and livestock feedlot cattle. See appendix A for further details on the field costs, replacement costs, and forgone income losses by commodity and by county.

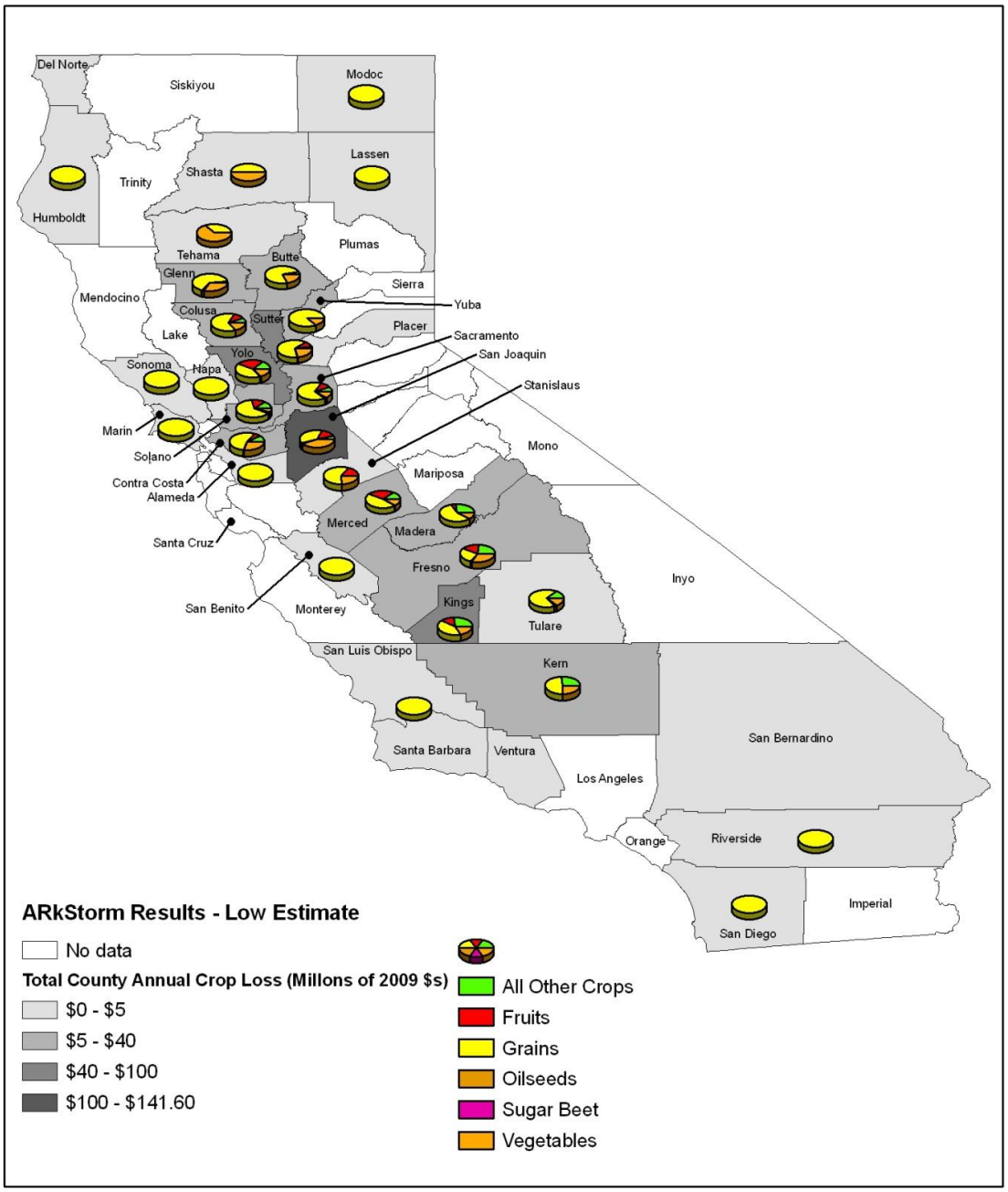

Figure 44. County annual crop field repair costs and income loss. Shading of county indicates estimated dollar losses. Colors on pie charts indicate percentage of losses from each of the listed crops.

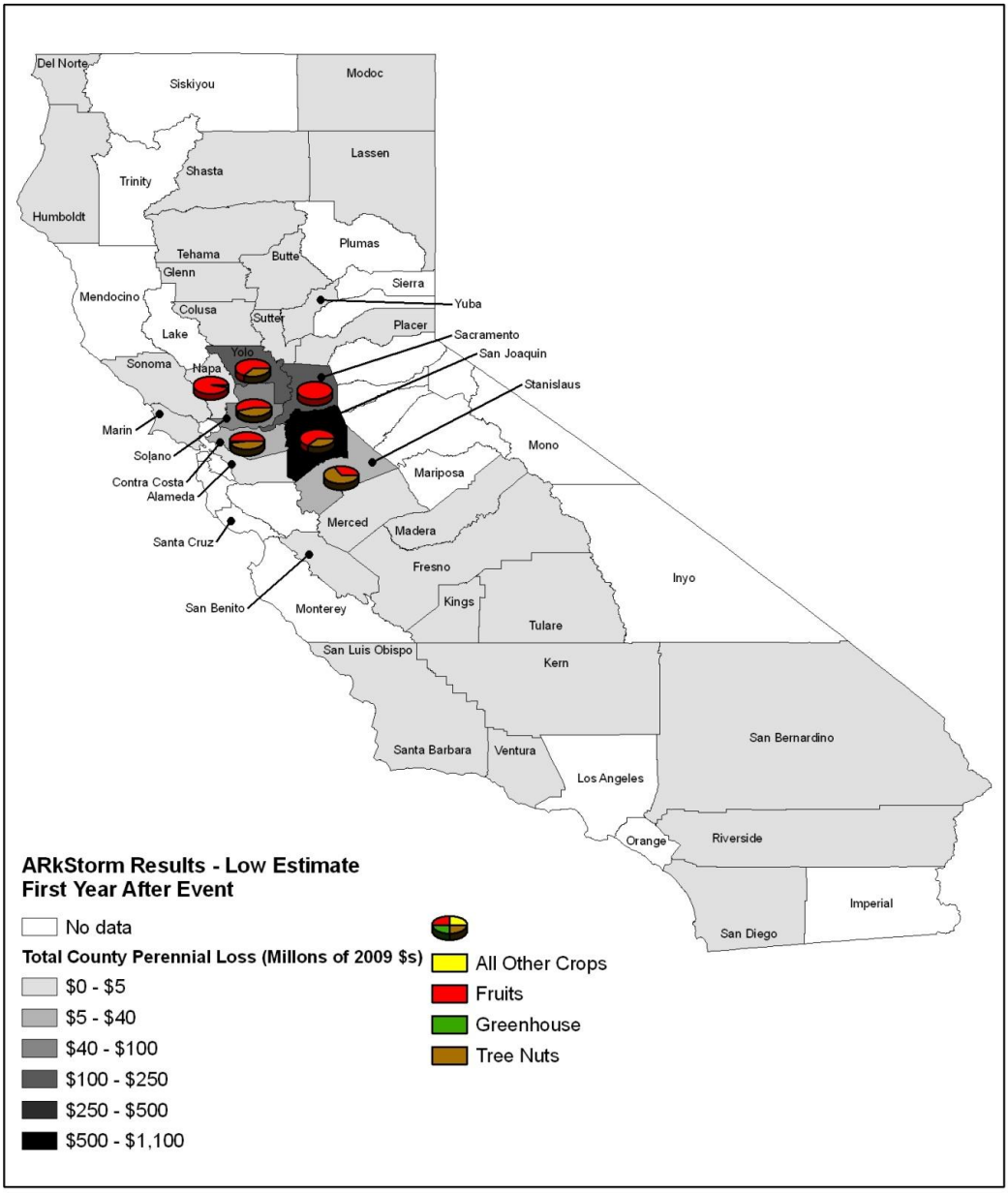

Figure 45. County perennial crop replacement and income loss (first year). Shading of county indicates estimated dollar losses. Colors on pie charts indicate percentage of losses from each of the listed crops.

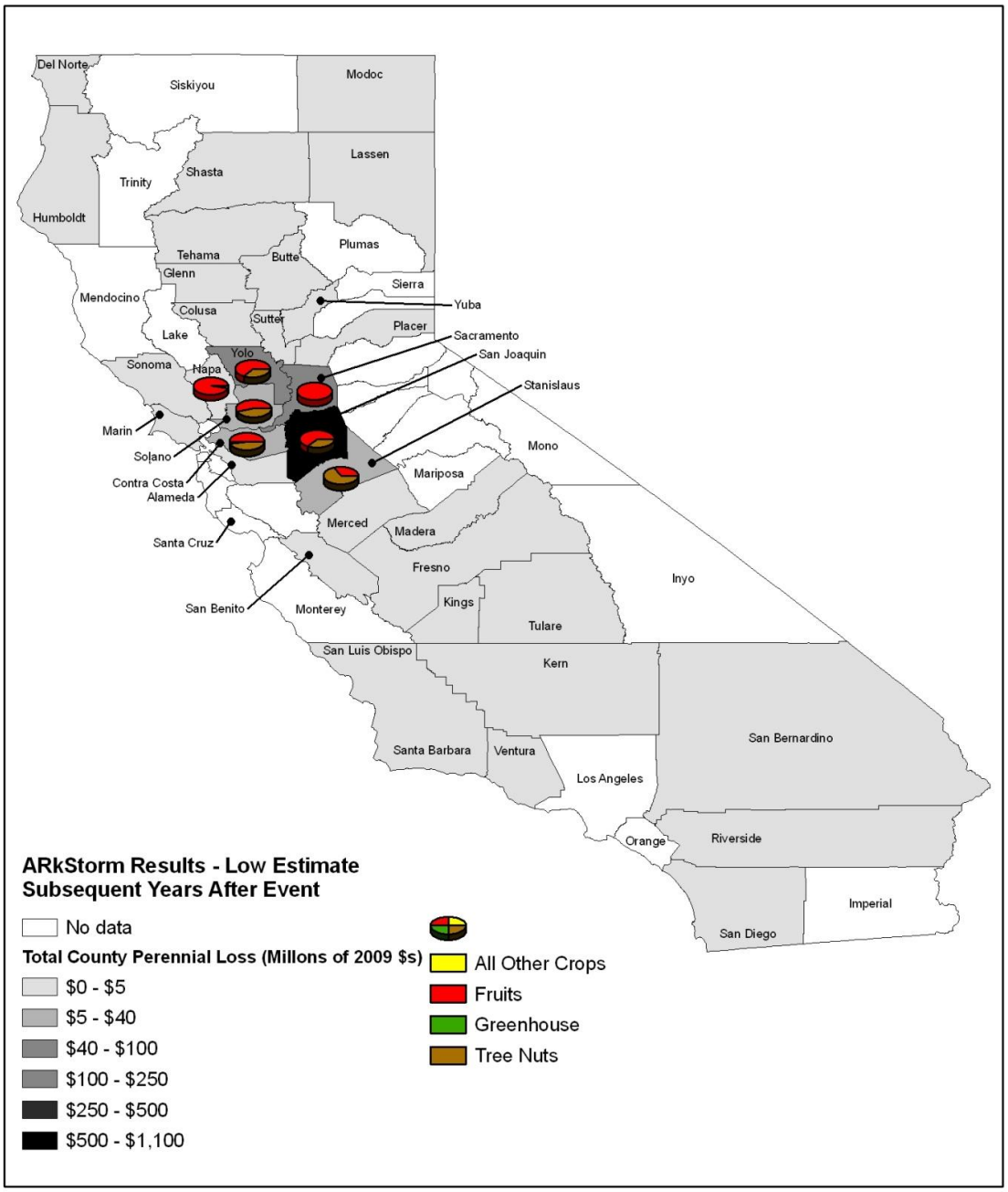

Figure 46. County perennial crop income loss (subsequent years). Shading of county indicates estimated dollar losses. Colors on pie charts indicate percentage of losses from each of the listed crops.

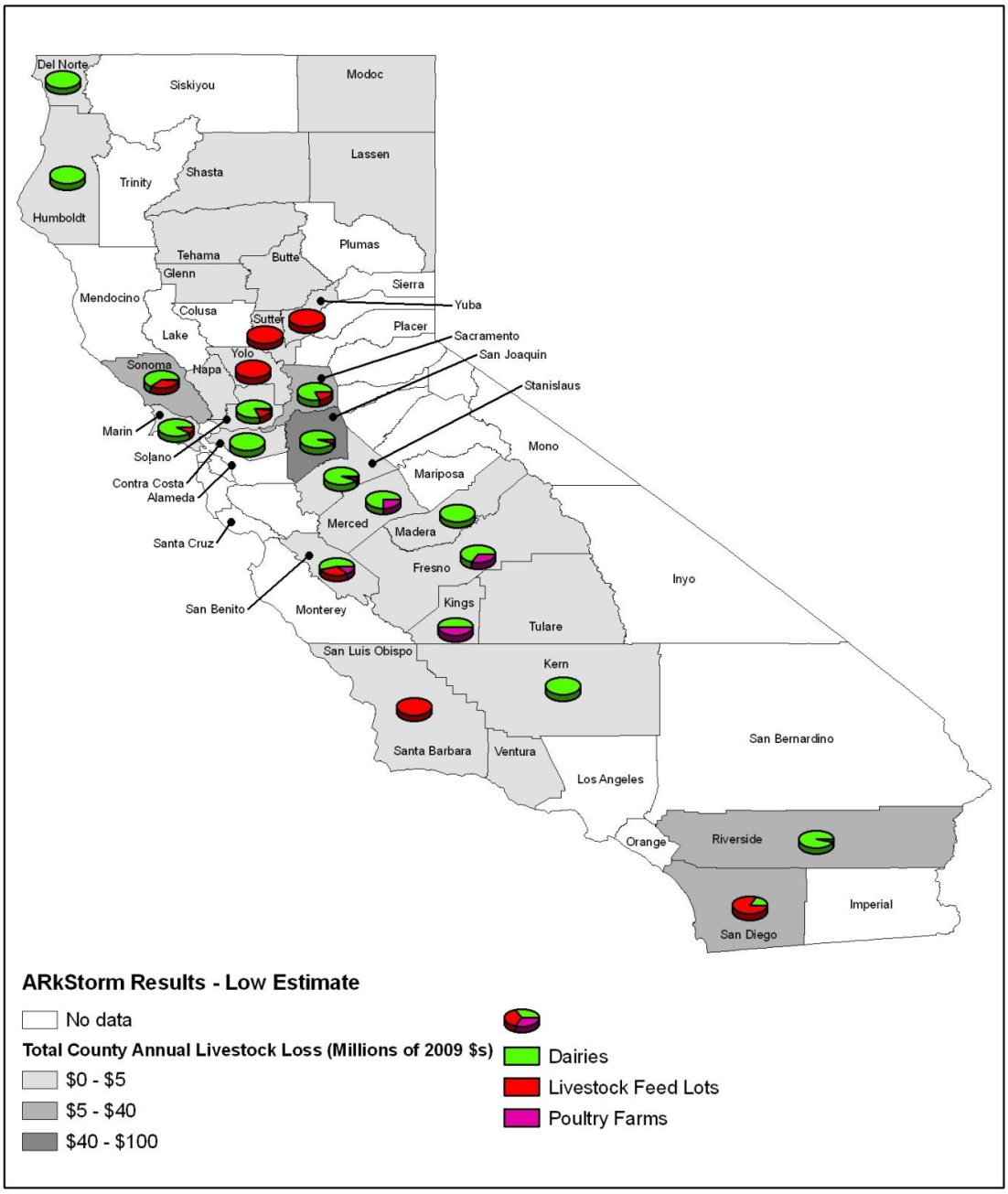

Figure 47. Livestock replacement cost. Shading of county indicates estimated dollar losses. Colors on pie charts indicate percentage of losses from each of the types of livestock listed.

Effects of Delays in Delta Island Dewatering

The above results were used in the economic impact analysis. Subsequently, we received a Delta Island scenario of levee breaching and times to repair and dewater islands (see the Levee section of this report) that alters the flood durations in the Delta area. The flooding of half of the roughly 60 islands in the Delta would present major logistical and response challenges. Levee repair and island dewatering would need to be prioritized and likely would be constrained by the availability of equipment, material, and labor required to stabilize and close levee breaches, repair levees, and pump out flooded islands. The analysis estimated that it could take up to one and a half years to dewater the 31 islands assumed to flood under the ARkStorm scenario. The analysis estimated that less than 40 percent of the islands would be dewatered within six months of the flood. Figure 48 shows the percentage of flooded islands estimated to be repaired and dewatered by time interval.

The flood duration times estimated for flooded islands in the Delta are longer than the ARkStorm flood durations used for the economic impact analysis. More extensive and prolonged disruption of agricultural production is the practical consequence of longer flood durations in these areas. Whereas, the flood durations used for the ARkStorm economic impact analysis implied that production of annual crops would be disrupted for one season, the Delta island dewatering analysis indicates that for some islands agricultural production could in fact be disrupted for multiple seasons. This means that agricultural damages could be greater than estimated by the above analysis for San Joaquin, Yolo, Sacramento, Solano, and Yolo Counties, which have substantial agricultural land in the Delta. The extent of underestimation is not expected to be large, however, because the majority of agricultural damage estimated by the ARkStorm analysis is associated with orchard and vineyard crops, which are not extensively grown on Delta islands.

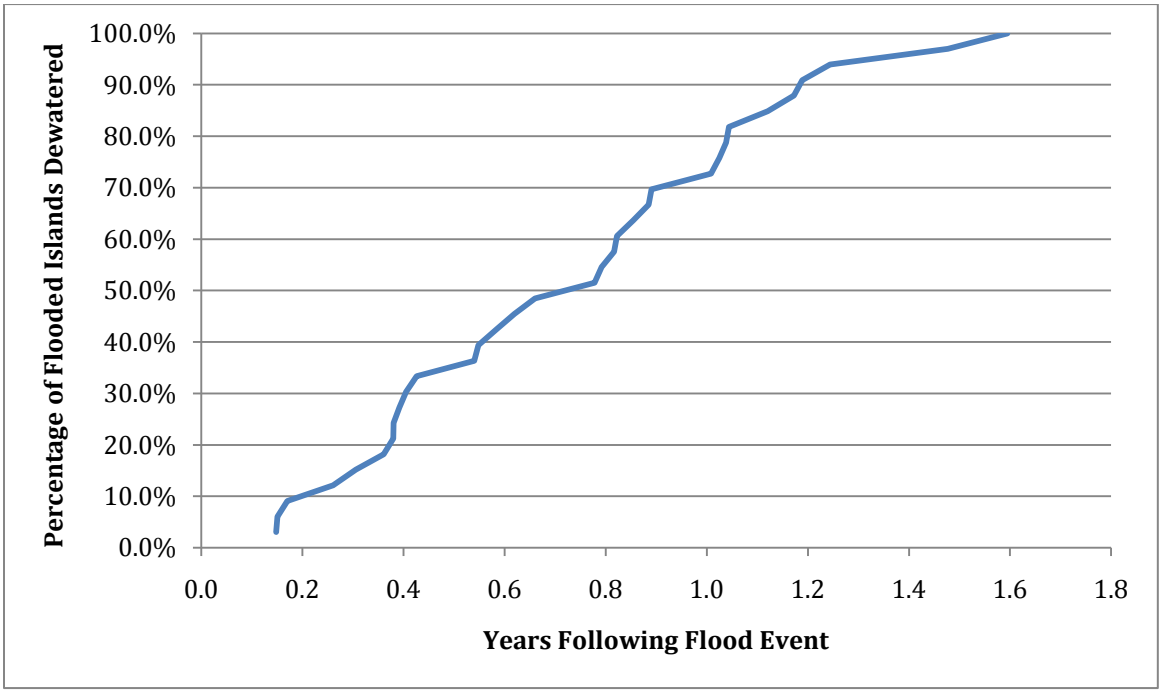

Figure 48. Time required to dewater 30 flooded Delta islands.

SUMMARY

The ARkStorm winter storm agricultural damages are an order of magnitude greater than 1997 flood damages. Statewide damages to crops, livestock, and fields were estimated to range between $3.7 and $7.1 billion.[8] Destruction of perennial orchard and vineyard crops accounted for most of the estimated agricultural production losses. We note that these perennial crop losses may have been underestimated because of the use of old survey information that in some areas may be more than 10 years old. Recent crop shifts away from field and forage crops toward fruit and vegetable crops, and especially toward orchards and vineyards may have affected the estimate. A quick look at the county agricultural reports of the 3 most-affected counties (Sacramento, San Joaquin, and Yolo) indicates that perennial crop acreage has increased by more than 20 percent in the last 10 years (Stephen Hatchett, Western Research Economics, 2010, written commun.). Damages to farm structures and equipment, were estimated separately at $13 billion by using the HAZUS-MH inventory and methodology.

Like the 1997 storm, San Joaquin and Sacramento Counties are among the counties most severely affected by the ARkStorm scenario, but damages in Yola, Solano, and Kings Counties are relatively more severe. Agricultural production in the Delta, much of which occurs on deeply subsided islands protected by increasingly fragile levees, appears to be particularly at risk.

MITIGATING AGRICULTURAL DAMAGES

It is not possible to move crops and farm structures out of harm's way during a flood. It is possible to provide buffers and barriers between these assets and flood waters. Thus flood protection for most agricultural assets depends on a broader set of land use and flood risk mitigation policies. In the case of livestock, given adequate advance warning and livestock relocation contingency plans, mobilization and relocation may be possible. Dairy is the most problematic because of the need for milking facilities. The California dairy industry has made some effort in recent years, in conjunction with the California Department of Food and Agriculture, to implement a formal emergency alert system that could be used to provide early warning in the event of a fast moving disease outbreak[9] or pending natural disaster, such as the threat of

[8] We have estimated repair and replacement costs of damaged assets and infrastructure. This estimate is consistent with damage estimates in the rest of the ARkStorm scenario report. Economic damages to landowners pertain to earlier replacement of perennial crops and livestock. Supposing perennial crops are replaced two-fifths through the useful life, and by using a real discount rate of 3 percent, the present value reestablishment cost is about 70 percent of the cost calculated simply as a new capital cost plus several years of no income.

[9] For example, experts estimate that in the case of an outbreak of Foot and Mouth Disease in California, each hour that the disease goes unrecognized could cost the dairy industry between one and three million dollars. (Dr. Michael Payne, Program Director, California Dairy Quality Assurance Program, written commun., 2010.)

flooding.[10] However, progress on the system has been stymied by industry concerns about how producer information needed to implement the system, some of which the dairy associations consider proprietary, would be safeguarded.

Even with a robust alert system in place, livestock producers also must be able to act on the information. Mobilizing and relocating livestock in large numbers presents obvious logistical challenges. Adequate transportation has to be available to move the livestock and the livestock have to have some place to go. The success of mobilizing and relocating large numbers of livestock on short notice will depend almost entirely on having emergency relocation plans and the resources necessary to implement those plans already in place. Our research suggests that planning in this area is not very far advanced. The level of contingency planning among livestock producers in not known and, likely, many do not have flood emergency response plans in place, according to at least one industry expert (M. Payne California Dairy Quality Assurance Program, written commun., 2010). Floods are rare events and responses are too often handled on the fly.[11] This may work when only a few isolated producers are affected, but such a strategy is sure to fail under a scenario such as ARkStorm.

Animal emergency response plans reside in county plans to varying degrees, but moving stock at the regional scale has not been examined. This response plan is on the agenda for the upcoming Golden Guardian 2011 exercise. After the 1997 storm, the California Animal Emergency Response System (CARES) was established. This system is being revitalized by the California Department of Food and Agriculture (CDFA).[12] "CARES will coordinate resources and decisions once an incident escalates to a state-level emergency; the CARES Plan is not intended to supersede local government plans but to assist them as they exhaust their resources" (California Department of Food and Agriculture, 2000).

RESEARCH NEEDS RELATED TO AGRICULTURAL DAMAGES

We neglected estimation of livestock disposal costs for livestock at risk. In addition, the agriculture sector will not only be directly affected by flood damages to crops and livestock, but also by associated power outages, well contamination, and access limitations. We capture sector interdependencies in the economic impact analysis. However, we note that further disruptions from

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[10] The proposed alert system had the capacity to send out 48,000 emails in 2 minutes, and provide additional follow-up through automated phone message recordings. (Dr. Michael Payne, Program Director, California Dairy Quality Assurance Program, written commun, 2010.)

[11] This situation is not unique to California. A recent news article tells the story of a Freeport, Illinois, dairy farm along the Pecatonica River that would have lost 500 head of cattle to rising flood waters but for the fact that a neighboring dairy in the process of doubling its operation had recently completed construction of new barns, which were temporarily standing empty. Had these barns not been available and had neighbors not pitched in to move the cattle, the herd may have been lost. The story illustrates the inherent challenges of moving even a relatively small number of livestock on short notice. (*http://gazettextra.com/news/2010/jul/29/larson-acres-provides-home-flooded-illinois-cows/* accessed on August 6, 2010.)

[12] John Rowden, California Department of Food and Agriculture,. written commun., August 17, 2010.

aqueduct damage and salinity were not studied, although, it is believed that initially the quantity of precipitation runoff will keep salinity at bay. Conversely, agricultural losses would indirectly affect other industrial sectors. The effects of crop losses (not livestock losses) on other sectors were evaluated in the ARkStorm economic impact analysis which allows for commodity price responses.

Finally, insurance payments and federal disaster payments are resilience strategies that would enable the recovery of the California agricultural sector, but the breakdown of insured and uninsured losses was not evaluated.

Building and Content Repair Costs

PROPERTY-DAMAGE METHODOLOGY

We use the HAZUS-MH methodology, its building exposure data, and its flood and wind vulnerability functions to estimate wind and flood damage to the general building stock resulting from the ARkStorm. However, we performed the loss calculations outside the HAZUS-MH software because (1) the ARkStorm flood map could not be readily imported into the HAZUS-MH flood module and (2) because the HAZUS-MH wind module does not include California. We adapted the Florida wind vulnerability and fragility functions for use in California by shifting those functions to account for lower design wind speeds (and, therefore, likely higher wind vulnerability) in California. We estimate damage and loss at each census block and by each of the 33 occupancy classes in HAZUS-MH, and then we aggregated to the state level. The full methodology is documented in Olsen and Porter (2010).

The HAZUS-MH methodology begins with a description of the inventory of assets exposed to loss. The inventory is characterized by estimates of the number of buildings, building area, building replacement cost (the cost to build a functionally and architecturally similar building at the same location, if the existing building were not there), content replacement cost (including furnishings, fixtures, equipment, and business inventories), and the number of building occupants at three times of day, based on working patterns. HAZUS-MH provides these quantities by census block and occupancy class. The estimates begin with data from the Census of Population and Housing and from the Economic Census. These and other sources provide estimates of the number of people living or working in a census block. The estimated total building area by census block is the product of the number of people and estimates of the per person square footage of the buildings these people occupy. Companies that estimate construction costs provide estimates of the replacement costs of the buildings (again, the cost to construct the buildings new, often estimated on a per-square-foot basis in construction cost manuals). Using insurance and other rules of thumb, one can then estimate the content value as a multiplicative factor of building value. The distributions of these building inventory characteristics by structure type can be estimated by using engineering experience and, in some cases, information from building departments and the insurance industry.

The building inventory as defined by HAZUS-MH is then overlain on the ARkStorm scenario maps of flood depth and wind speed (fig. 8, and fig. 9). When there is an asset in the inventory that is exposed to flooding or damaging winds, we find the damage ratio from a vulnerability function for that asset's structure type. A vulnerability function is a relationship between an environmental excitation—here, flood depth or wind speed—and the ratio of repair cost to replacement cost, known as the damage ratio. We use unmodified HAZUS-MH flood vulnerability functions, but we modify the HAZUS-MH wind vulnerability functions as described in a subsequent paragraph. Figure 49 shows flood vulnerability functions for several structural types of residential occupancy. HAZUS-MH vulnerability functions provide the mean, or expected value, of the damage ratio given the

environmental excitation; the uncertainties in the vulnerability functions are not estimated. We calculate the expected loss by multiplying the damage ratio by the value exposed for each combination of census block, occupancy class, and structure type. Adding up the loss for each combination leads to an estimate of aggregate repair cost.

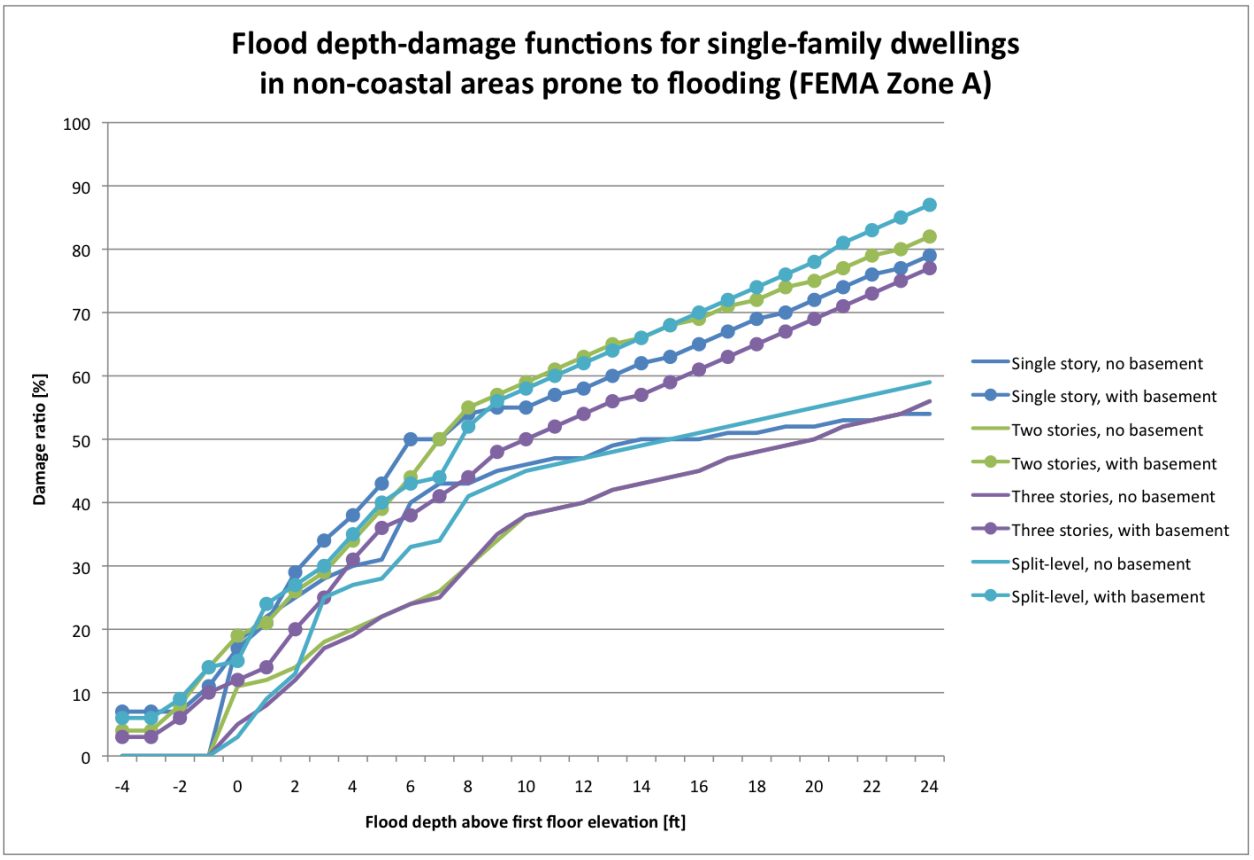


Figure 49. Sample HAZUS-MH flood vulnerability functions showing damage ratio for different types of single-family dwellings.

Equation (3) states mathematically what we have just described. L represents the expected value of loss, such as building repair cost. The three large Greek sigma characters mean "sum over" or "add up" and the letters beneath them—i, j, and k—are counters, referring respectively to census blocks (i), occupancy classes (j), and structure types (k). The term $V_{i,j,k}$ represents the estimated value exposed to loss in census block i, occupancy class j, and structure type k. $V_{i,j,k}$ is multiplied by $y_{j,k}\ \ x_i$, which is the vulnerability function evaluated at location i. In other words, $y_{j,k}\ \ x_i$ is the mean damage ratio for an asset of occupancy class j and structure type k, when exposed to the environmental excitation x experienced by census block i.

$$L = \sum_i \sum_j \sum_k V_{i,j,k} \cdot y_{j,k}\ \ x_i \qquad (3)$$

We modified the wind vulnerability functions encoded in HAZUS-MH for use in California. HAZUS-MH does not have a wind model for California, so we used vulnerability functions from its Florida hurricane model. The International Building Code defines the primary wind speed to be used for the design of buildings (known as the basic wind speed) as 85 mph for sites in California and as 130 mph ± 20 mph for sites in Florida (American Society of Civil Engineers, 2006). We assume that a California building exposed to 85 mph winds would be damaged to the same extent as a similar Florida building exposed to 130 mph winds. Thus, we shift the wind speed axis of the Florida vulnerability functions to account for the lower basic wind speed in California when compared to Florida.

PROPERTY-DAMAGE SCENARIO

Based on the methodology described in the previous section, the estimated repair cost for flood-induced building damage is about $200 billion, which is equivalent to approximately 7 percent of the HAZUS-MH estimate of the replacement cost of all buildings in California ($2.7 trillion), or 2-3 years of statewide construction spending at 2006-2007 rates (about $75 to $100 billion per year). Flood-related content losses are estimated to contribute another $100 billion. The reason for these very high flood-related losses is evident when examining the flood maps in detail. Figure 50 through figure 53 show extensive inundation of urban areas in Sacramento, Stockton, the San Jose area, and Los Angeles and Orange Counties.

Using the HAZUS-MH methodology, inventory, and vulnerability functions, we first calculated flood-related content losses as roughly equal to flood-related building losses. However, this result seemed unreasonable: the content losses seemed too high—perhaps by a factor of two—relative to the building losses. To check whether the content losses ought to roughly equal building losses, we examined National Flood Insurance Program claims documented in a FEMA Flood Mitigation Assistance database. The Flood Mitigation Assistance grants in the database mostly were dated between 1996 and 2003. We examined all claims where there were nonzero building losses and nonzero content losses. There were 485 such claims, dated between 1977 and 2001. These claims totaled about $8.6 million for building losses and $5.1 million for content losses, or roughly a $0.60 content loss per $1.00 of building loss. These claims data reinforce our doubts about the content losses first estimated in the ARkStorm scenario. The 0.60:1.00 ratio implied by the Flood Mitigation Assistance data is close to an upper boundary because the database showed many properties with repetitive losses where some, but not all, of the claims included content losses. These data suggest that there are properties with both structure and content coverage that experienced claims with structure loss but not content loss. Such claims are not included in the $8.6 and $5.1 million loss totals. If these claims were added to the totals that would increase the $8.6 million figure but not the $5.1 million figure. With this evidence in mind, we somewhat arbitrarily reduced by half the content losses estimated with the HAZUS-MH methodology and data, and we reported that value in the above paragraph.

HAZUS-MH data on California census blocks include classification as riverine or coastal. The loss from flood damage to building structures in all coastal census blocks is $29 billion, and the loss from flood damage to building structures in all riverine census blocks is $164 billion. This loss in coastal areas is 15 percent of the total flood loss from structural damage. Note, however, that we calculated all property losses from the flood map derived from rainfall runoff, not from the coastal inundation study in Southern California.

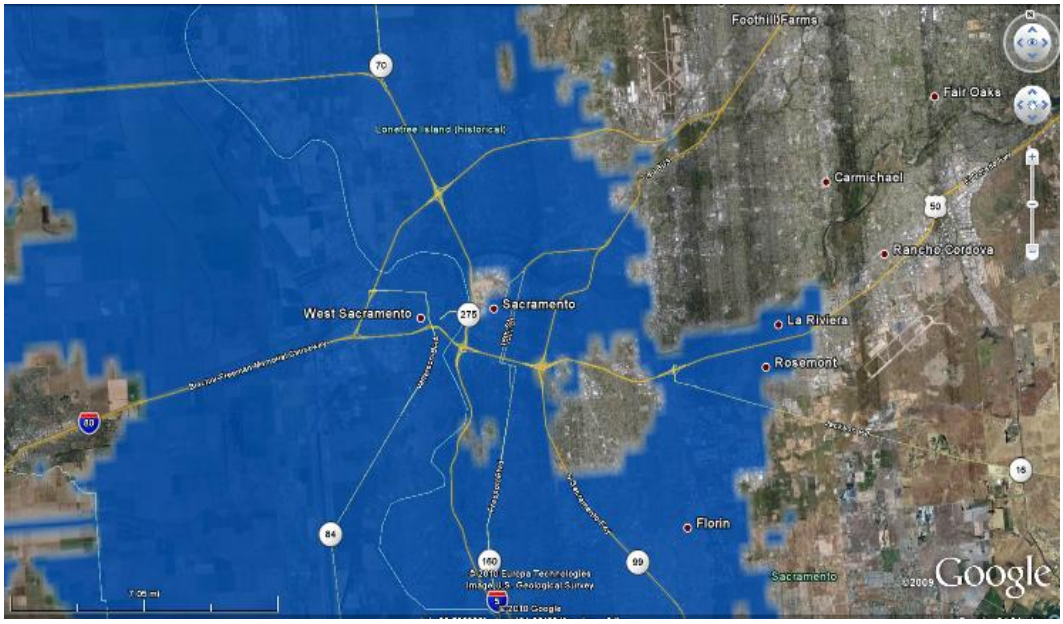


Figure 50. ARkStorm hypothetical flooding in Sacramento.

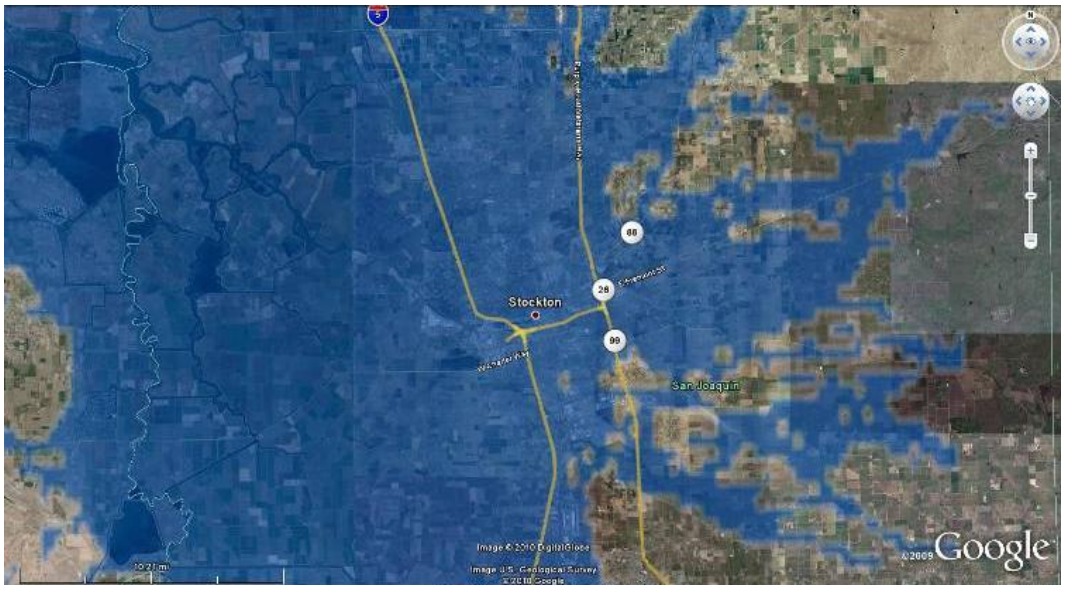


Figure 51. ARkStorm hypothetical flooding in Stockton.

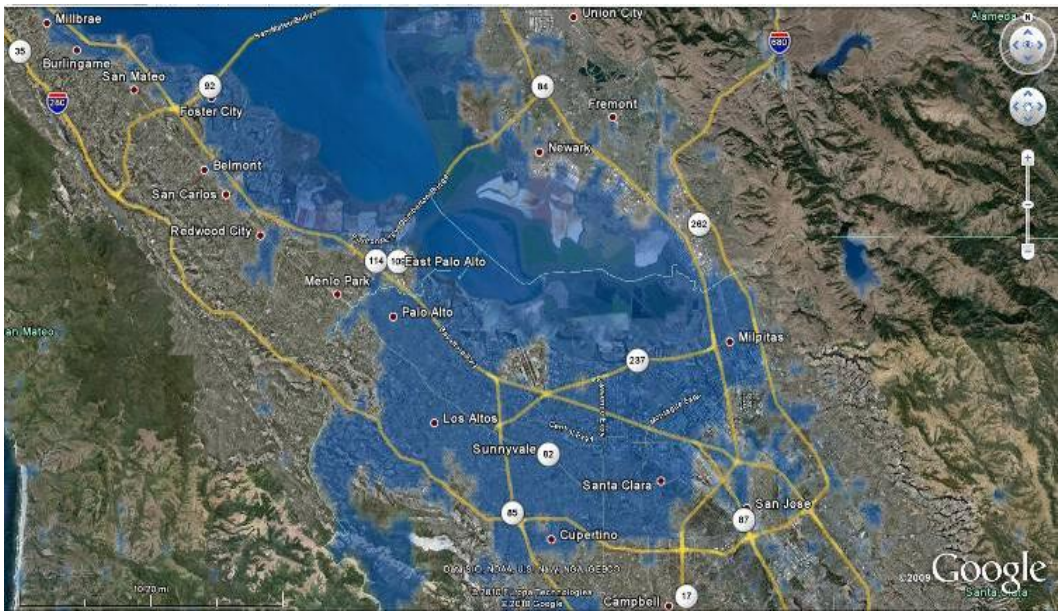


Figure 52. ARkStorm hypothetical flooding in the San Jose area.

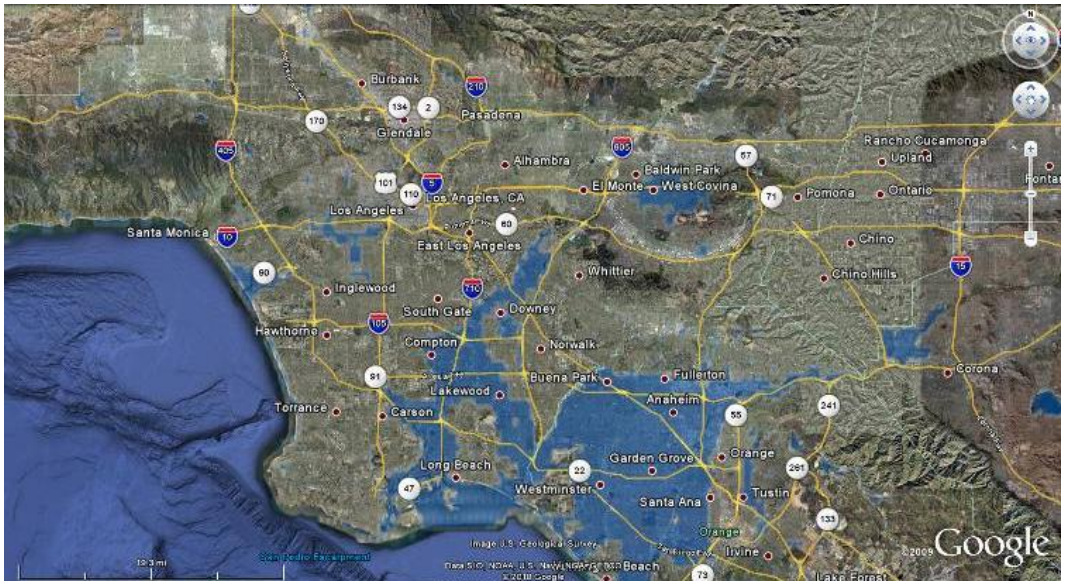


Figure 53. ARkStorm hypothetical flooding in Los Angeles and Orange Counties.

Wind-related building repair costs are estimated to be $6 billion. A $6 billion loss from wind damage alone would constitute a significant natural disaster, but in comparison with the $200 billion loss from flood damage, the amount is relatively small. Wind damage contributes such a small fraction of the overall loss because the areas of highest winds also are sparsely populated. Furthermore, although the wind speeds in the ARkStorm are large (fig. 9), the current basic wind speed for design exceeds the scenario wind speeds by 25 mph or more in most areas of the ARkStorm. For comparison, figure 54 maps the current basic wind speed for California (American

Society of Civil Engineers ,2006). In fig. 54, the basic wind speed is 85 mph (38 meters per second) in California. Shaded areas denote special wind regions where unusual wind conditions exist.

We do not calculate the loss to building contents from wind damage. The wind vulnerability functions for contents cannot be extracted from the HAZUS-MH software or documentation for most occupancy classes. Nonetheless, it seems reasonable that content losses caused by wind damage would be negligible in comparison to content losses from flood damage. Again, the areas of highest wind speeds have a low potential for property loss.

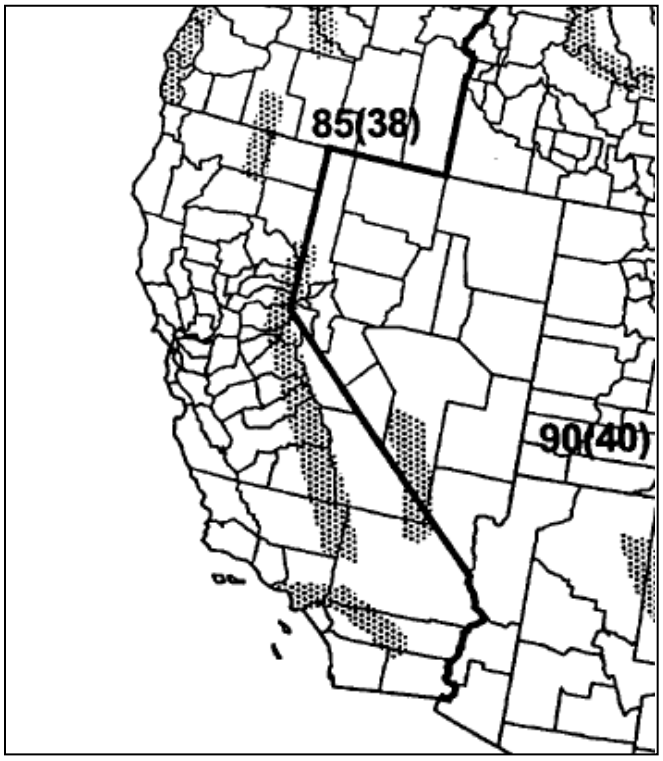


Figure 54. Basic wind speed map for California (American Society of Civil Engineers, 2006, figures 6-1) and adjoining states, showing zones where basic wind speed for design is 85 miles per hour (38 meters per second) and 90 miles per hour (40 meters per second).

Nearly one-quarter of the total building square footage in California is affected by flooding in ARkStorm, with little variation of this ratio between occupancy classes (fig. 55) Most flooded buildings are not a total loss, but rather experience damage requiring repair costs between 10 percent and 50 percent of replacement cost. Residential buildings dominate the flood-related building repair costs, as shown figure 56. Residential buildings (labeled "RES" in Figure 56) account for 81 percent of the total estimated flood-induced building repair costs and 96 percent of wind-related losses. Commercial ("COM") buildings account for 13 percent and 2 percent of loss from flood and wind damage, respectively. The modest balance of loss is from damage to buildings with the following occupancy classes: industrial ("IND"), religion or nonprofit ("REL"), governmental ("GOV"), education, ("EDU") and agriculture. ("AGR"). Table 14 lists property losses by county, divided according to flood- or wind-related loss.

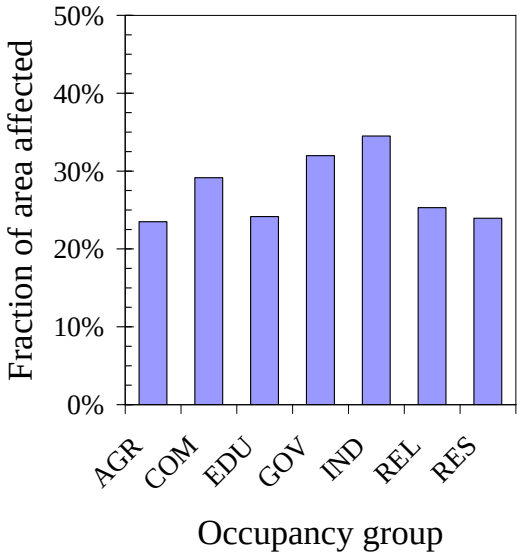


Figure 55. Fraction of building square footage affected by ARkStorm flooding for buildings in the occupancy classes agriculture, commercial, education, governmental, industrial, religion or nonprofit, and residential.

RESILIENCY AND RESEARCH NEEDS FOR BUILDING DAMAGE

Although the purpose of the work described in these sections is to estimate property losses, a few obvious opportunities for research and improved resiliency present themselves:

- ***Consider mold in post-flooding inspections***. This scenario disaster has a large number of flooded buildings, which raises questions about how safety inspections would be performed after a real-world California flood. A standard methodology from the Applied Technology Council (ATC)—known as ATC-45—exists for performing these inspections and posting the safety of buildings (Applied Technology Council, 2004). The ATC-45 methodology establishes the level of safety based on observed damage resulting from: inundation; hydrostatic and hydrodynamic forces; waves; erosion and scour; and various kinds of wind damage. After Hurricane Katrina in 2005, building inspectors in New Orleans performed safety inspections for more than 100,000 buildings. This experience showed that mold also can be a source of damage resulting from flooding, and can endanger occupants' safety. While mold is a more modest concern after a California winter storm, it may be worthwhile to consider procedures that address mold in the ATC-45 methodology.

- ***Expand training for ATC-45.*** A large cadre of structural engineers and others has been trained to perform post-earthquake safety inspections. Training for inspection of flood and wind damage in California has been more modest.

- ***Examine flood warning systems***. Research in the late 1960s by the U.S. Army Corps of Engineers, New York District, suggested that 48 hours of advanced warning could reduce riverine flood damage in the Passaic River Basin in New Jersey by up to 35 percent. The developers of the HAZUS-MH flood module observed that this was an upper boundary and that in practice the savings would probably be less than this hypothetical maximum. If 48 hours of warning could reduce property losses by 10 percent in the ARkStorm. This reduction is equivalent to at least $30 billion, a significant avoided loss.

- ***Develop California wind vulnerability functions.***

- ***Continue to improve the building inventory***. Special attention is needed for the presence or absence of basements in single-family residences.

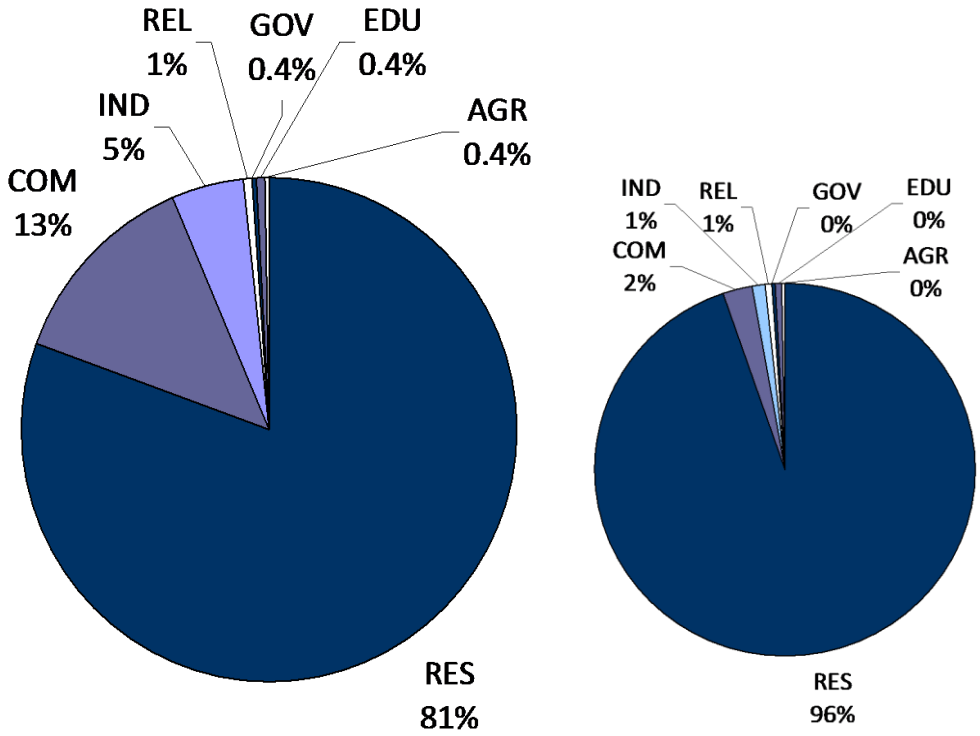


Figure 56. Contribution to $200 billion in flood-related building repairs (left), and $6 billion in wind-related building repairs (right) for buildings in the occupancy classes agriculture, commercial, education, governmental, industrial, religion or nonprofit, and residential.

Table 14. ARkStorm property loss by county. $1,000s, on replacement-cost basis. [values do not sum exactly to the total shown because of rounding]

County	Flood	Wind
Alameda	14,000,000	270,000
Alpine	3,300	3,300
Amador	10,000	10,000
Butte	320,000	61,000
Calaveras	9,300	9,600
Colusa	230,000	9,100
Contra Costa	16,000,000	430,000
Del Norte	220,000	2,600
El Dorado	120,000	120,000
Fresno	66,000	18,000
Glenn	29,000	11,000
Humboldt	1,400,000	5,100
Imperial	5,500	6,100
Inyo	47,000	59,000
Kern	220,000	140,000
Kings	44,000	13,000
Lake	14,000	16,000
Lassen	60,000	31,000
Los Angeles	46,000,000	580,000
Madera	29,000	190
Marin	8,500,000	72,000
Mariposa	1,600	1,300
Mendocino	1,400,000	26,000
Merced	65,000	18,000
Modoc	23,000	7,100
Mono	44,000	47,000
Monterey	280,000	280,000
Napa	2,000,000	33,000
Nevada	33,000	33,000

County	Flood	Wind
Orange	50,000,000	22,000
Placer	120,000	120,000
Plumas	19,000	20,000
Riverside	1,600,000	580,000
Sacramento	29,000,000	92,000
San Benito	320,000	45,000
San Bernardino	840,000	850,000
San Diego	25,000,000	24,000
San Francisco	990,000	180,000
San Joaquin	22,000,000	72,000
San Luis Obispo	440,000	86,000
San Mateo	11,000,000	380,000
Santa Barbara	1,300,000	73,000
Santa Clara	40,000,000	59,000
Santa Cruz	66,000	62,000
Shasta	270,000	49,000
Sierra	5,300	5,400
Siskiyou	7,400	7,700
Solano	7,000,000	130,000
Sonoma	5,500,000	86,000
Stanislaus	140,000	55,000
Sutter	2,400,000	41,000
Tehama	130,000	22,000
Trinity	990	79
Tulare	17,000	2,200
Tuolumne	6,900	7,300
Ventura	4,300,000	34,000
Yolo	3,800,000	47,000
Yuba	1,000,000	24,000
Total	300,000,000	5,500,000

DEMAND SURGE

If an event, such as an earthquake or flood, damages a very large number of properties, the cost to repair a given amount of damage at a particular property can be greater than to repair the same damage if fewer other properties were damaged. This increased repair cost is known as "demand surge," and is a poorly understood socioeconomic phenomenon of large-scale natural disasters. Demand surge has caused estimated cost increases of 20 percent (for example, the 1994 Northridge Earthquake; Kuzak and Larsen, 2005) to 50 percent (for example, Cyclone Larry in 2006; Australian Securities and Investments Commission, 2007) in past catastrophes, and the ARkStorm would certainly measure among the largest of these catastrophes in terms of absolute dollar repair costs. However, two important mitigating circumstances are present in ARkStorm. First, there is a low penetration of flood insurance policies in California, and the small number of policies means many owners of damaged properties may not have access to immediate funds to pay

for repairs. Consequently the demand for repair materials and labor might be spread over a longer time period as funds become available. Second, the anticipated low economic growth in early 2011 suggests that demand for new construction will remain low. Construction laborers and contractors may not seek a premium for working in flooded areas if they do not have work on new construction projects. The research team estimates that demand surge would be on the order of 20 percent for ARkStorm. The estimated total property loss is about $306 billion, not including lifeline repairs, which could bring the total property loss after demand surge to perhaps $367 billion. Olsen (2010) estimated in detail the anticipated amount of demand surge in the ARkStorm.

COMPARISON WITH PAST EVENTS

To judge whether the estimated property losses in the ARkStorm are reasonable, we compared this loss with the experience of Hurricane Katrina, which made landfall in Florida and Louisiana in August 2005. Katrina cost at least $81 billion in property damage (Blake and others, 2007). As reported by St. Onge and Epstein (2006), the Bush Administration sought $105 billion for repairs and reconstruction in the region. An unknown—but large—fraction of the loss occurred in the City of New Orleans, which had a population at the time of about 1.2 million people and a land area of about 180 square miles. Of these totals, about 140 square miles and the homes of approximately 1 million people experienced flooding. If we assume that one-half to three-quarters of the total property loss in Katrina is because of flooding in the City of New Orleans and the reported losses are a depreciated value (at 75 percent of the replacement cost new value), then the property loss in Katrina is roughly $54,000 to $81,000 per person with flood damaged property.

For comparison, ARkStorm flooding covers about 4,000 square miles (much of it agricultural) and occurs in census blocks containing a population of about 6.5 million. If we apply the loss-per-person values from Katrina, we would expect property losses in ARkStorm of $350-530 billion, which agrees reasonably well with the estimated $370-440 billion total from building property damage, lifeline repair cost, and agricultural property loss estimated for ARkStorm.

An insurance expert (G. Michel, Willis Ltd, written commun., September 22, 2010) indicated that his back-of-the-envelope estimate for expected property losses from building damage in ARkStorm would have been on the order of $200 billion, before demand surge, for a similar-sized event, as opposed to the $300 billion estimated here. However, his back-of-the-envelope calculation assumes average residential claims of $20,000; whereas, a review of 485 claims discussed earlier suggests a figure closer to $28,000. Adjusting for this difference, the agreement between the insurer's back-of-the-envelope calculation and that produced here is reasonable. Nonetheless, the difference emphasizes the uncertainty inherent in such modeling efforts. This discrepancy between the expectation of an insurance expert and the calculated ARkStorm property losses highlights the need for validation of the building inventory, vulnerability functions, and overall losses, for example, by comparing these results against recorded losses (insured and otherwise) from historic natural disasters.

Insurance Impacts

INTRODUCTION

California is a dynamic insurance market. Insurance coverage is provided for fire, wind, flood, and earthquake, among other natural perils. At year end 2009, there was a total of $21.5 billion in direct written property insurance premiums in the state (Highline Data, 2009) accounting

for 12 percent of the U.S. premium volume. The physical damage to structures from wind is primary covered under standard residential or nonresidential insurance policies to protect the wealth and livelihood of inhabitants. The damaging effects of flood are generally not covered under residential or nonresidential property policies and must be purchased separately, in the case of residential coverage, or in addition to the coverage offered under the standard commercial property policy.

An individual or businesses decision to purchase flood insurance requires an analysis of the cost of insurance coverage, if coverage is even available, weighed against the benefits provided by the insurance policy and the risk of flooding. In the case of residential flood insurance, the homeowner may be required to purchase a flood policy as a requirement of securing a mortgage on the property. A policy premium is paid for the term of the insurance contract and policy coverage limits are offset by a deductible that must be met before the claim is paid.

Following is a brief summary of insurance coverage available in California for the perils of flood and wind. References are provided for more in-depth understanding of the insurance dynamics. Insurance loss estimates were derived from the damage estimates in this report and an estimate of the insurance availability. Because of limited data on insurance availability within the highest risk flood areas, we made broad assumptions across the counties affected to arrive at a range of loss estimates that we believe to be reasonable.

CALIFORNIA FLOOD AND WIND INSURANCE COVERAGE

The primary cause of loss in the ARkStorm scenario is flooding. Flood insurance for residential homeowners in California is primarily covered by the National Flood Insurance Program (NFIP). The NFIP was established in 1968 with the passage of the National Flood Insurance Act. The NFIP was broadened and modified with the Flood Disaster Protection Act of 1973, the National Flood Insurance Reform Act of 1994 and the Flood Insurance Reform Act of 2004 (Federal Emergency Management Agency, 2010a). The NFIP is administered by the Federal Emergency Management Agency (FEMA), a component of the U.S. Department of Homeland Security.

The NFIP enables property owners in participating communities to purchase flood insurance as an alternative to disaster assistance. Communities participating in the NFIP must agree to enforce a floodplain management ordinance to reduce future flood risks in specially designated flood hazard areas. The federal government, through the NFIP, will make the insurance coverage available as a means of financial protection against flood losses.

To make insurance coverage available to property owners, insurance companies participate in a Write Your Own (WYO) program, and service the NFIP Standard Flood Insurance Policy in their name. The federal government retains the responsibility for the insurance coverage and pays the WYO carrier an administration fee to cover the expense of writing the policy and processing the claims. Currently (2010), about 100 insurance companies write flood insurance with FEMA. Top carriers in California include State Farm, Allstate, Hartford, Zurich, and Travelers.

NFIP insurance coverage (table 15) is provided for the building and contents of residential properties up to $250,000 and $100,000, respectively, and $500,000 for both building and contents coverage for nonresidential properties. Deductibles are applied separately to building and contents coverages and vary by policy and higher deductibles will result in a reduced premium for the policyholder.

Table 15. National Flood Insurance Program flood insurance coverage.

Building Coverage	Limits
Single Family Dwelling	$250,000
Two to Four Family Dwelling	$250,000
Other Residential	$250,000
Non-Residential	$500,000
Contents Coverage	Limits
Residential	$100,000
Non-Residential	$500,000

As of December 31, 2009, WYO carriers in California wrote a total of $179.5 million (Highline Data, 2009) of premiums for a total of $17.7 billion of policy limits (National Flood Insurance Program, 2010).

For nonresidential properties (in this case, the commercial, industrial, religious, governmental, education, and agricultural properties included in the study), in addition to the NFIP, businesses have the opportunity to insure against flood loss in their standard property policy or Difference in Conditions (DIC) policy. Insurance companies writing these policies offer larger policy limits, various deductible options, and are tailored to the specific insurance needs of the commercial business and its property locations. These carriers include FM Global, CNA, Allianz, Chubb, Lexington, Westchester, Arrowhead, and RLI, among others.

For wind coverage, wind is typically a covered peril in the standard property insurance policy offered by insurance carriers for both residential and nonresidential properties.

INSURANCE LOSS FROM THE ARKSTORM SCENARIO

According to this study, total flood-induced building damage is estimated at $200 billion. Flood related contents losses are estimated at $100 billion for a combined total of $300 billion. Flood related losses would only be covered by insurance policies that provide flood related coverage. In order to estimate the part of flood related damage that may be covered by insurance, we need to estimate the proportion of property exposure that is covered by insurance. In order to do this, we calculated an insurance penetration or take-up rate. Based on published NFIP policy limits by county (National Flood Insurance Program, 2010) and the exposed values provided with the HAZUS MH exposure data (National Institute of Building Sciences and Federal Emergency Management Agency, 2009) used in the flood-induced damage calculation, it is estimated that 2.4 percent of the total residential property exposed values are covered for flood by the NFIP. The breakdown of residential to nonresidential NFIP coverage limits is unavailable. Therefore, for purposes of calculating the NFIP insurance penetration or take-up rate, we have conservatively assumed all NFIP policy limits written provide residential coverage. We have made no provision for nonresidential coverage offered by the NFIP.

Nonresidential flood coverage is provided by the NFIP standard commercial property policies or through Difference In Conditions policies, only if the flood risk is acceptable to the carrier. It is generally, expected that flood insurance will be purchased if the risk is acceptable and the insurance premium is reasonable. However, information about the actual take-up rate of nonresidential flood insurance coverage is not publicly available. For purposes of our analysis, we have assumed a range of take-up rates from 20 percent to 90 percent, varying by county. Our estimates vary by county in a similar proportion to the actual NFIP take-up rates with the highest coverage take-up found in the northern counties of Yuba, Sutter, and Colusa, just north of Sacramento.

For the calculation of an insured loss estimate, we have applied the penetration rates for residential and nonresidential flood insurance coverage to the flood damage estimates by county and line of business. For a flood damage estimate of $300 billion, we estimate the flood insurance loss to be in the range of $20 billion to $30 billion.

For wind insurance loss estimates, we must cite the "Efficient Proximate Cause" language, which comes into play in California insurance law. The efficient proximate cause applies to an "All Risk" insurance policy when a loss is caused by a combination of a covered peril and a specifically excluded peril. The loss is covered only if the covered peril was the efficient proximate cause. The loss is excluded if the excluded risk was the efficient proximate cause of loss. This is subject to interpretation and there have been many cases involving efficient proximate cause language (Johnson 1999), the subject and review of which is beyond the scope of this analysis. Flood damage exceeds the wind damage estimates in all counties in the ARkStorm scenario; therefore, flood damage was assumed to be the proximate cause of loss for all properties. Accordingly, only the flood insurance policy would respond for insurance coverage. Litigation and judicial rule may require wind policies to respond; however, this is not contemplated explicitly in our estimates.

For purposes of estimating the insurance loss, it is estimated that the flood policy will respond to offer coverage, to the extent a policy covering flood is in place. If no flood policy is in place, the wind policy would not respond because of the efficient proximate cause language.

Table 16 shows the estimated residential flood insurance loss, covered by the NFIP, and the estimated range of nonresidential flood insurance loss assuming a moderate and high level of insurance take-up.

Table 16. Insured loss estimate for different levels of insurance.

Residential	Nonresidential*		Total	
NFIP only	Moderate Insurance Take-up	High Insurance Take-up	Moderate Insurance Take-up	High Insurance Take-up
$2.1 billion	$20.1 billion	$26.4 billion	$22.2 billion	$28.5 billion

*Commercial, Industrial, Religious, Governmental, Education, and Agricultural.

Computing the NFIP loss as a percentage of the insurance available, $2.1B per $17.7B, or 12 percent, is a reasonable damage ratio for the amount of insurance available. We are unable to perform the same calculation for nonresidential flood insurance because the amount of flood insurance written is unknown. However, we believe our estimates to be reasonable.

HISTORICAL PRECEDENT AND ECONOMIC RESILIENCY

California is best known for its earthquake and wildfire events. California is not generally known for its windstorm or flood events. In fact, since 1952, there have been 63 windstorm-related natural peril events and only 9 of these have involved some form of flooding. Interestingly, all the flood related events have occurred since 1995. The largest of these was an insured loss of just under $400 million in 2008 (Property Claims Service, written commun.). This report, however, provides the evidence that significant wind and flood events have the potential to occur.

The largest natural peril wind and flood insured loss event was Hurricane Katrina. Katrina was a Category 3 hurricane that made landfall on August 29, 2005. Katrina impacted the Louisiana and Mississippi coastlines with storm surge as high as 25 feet and contributed to the levee failure in New Orleans. For this reason, Katrina is thought of as two catastrophic events; the hurricane winds and the flood that ensued from the failure of the levee system. While total economic losses are not tracked, the estimated economic losses for Katrina exceeded $100 billion (Insurance Journal, 2005).

The insurance loss to Katrina is estimated at $41.1 billion (Insurance Information Institute, 2010) resulting from 1.7 million claims. This estimate does not include the total flood loss to the NFIP that is estimated at $16.1 billion from 167,000 claims (Federal Emergency Management Agency 2010b). Combined, the total insured loss is just under $60 billion.

Obviously, Katrina is not a direct comparison to the ARkStorm scenario but Katrina is the most relevant event in recent history. Katrina caused significant economic disruption in the New Orleans and Gulf coast region; disruption that remains today (2010); however, the impact to the U.S. economy was mitigated for a few reasons. First, the economic production capabilities as measured by the Gross State Product (GSP) of the Gulf region are lower than the national average. The GSP for Louisiana and Mississippi is $225 billion and $93 billion (Chantrill, 2010), respectively, compared to the national average of $292 billion. Next, the general population affected is small with 7.6 million people living in Louisiana and Mississippi or 2.1 percent of the U.S. population. Lastly, nearly 60 percent of the damages were insured that has provided the funds to allow people to rebuild, contributing to a faster recovery.

By contrast, for the ARkStorm scenario, the GSP of California is $1,870 billion or nearly 6 times that of Louisiana and Mississippi combined. The population of California is 38.1 million or 12.3 percent of the U.S. population. And it is, estimated that only 6 percent to 10 percent of the economic damages would be insured. Undoubtedly a repeat of the 1861-62 winter storm would have a significant impact not only on the California economy but on the U.S. economy as well.

RESEARCH NEEDS RELATED TO INSURANCE

These are the two most compelling research needs from our viewpoint:

1. *Wind vs. Water:* determining the primary cause of loss. Study ways to more quickly and efficiently determine if wind or flood is the primary cause of loss. Efforts in this area will help reduce litigation expense, reduce pressure on policyholders who may need to prove the cause of loss, and generally create a more efficient claims handling process that will benefit insurers and policyholders alike.

2. *NFIP reform.* The current structure is not capable of handling the size of the loss potential today. The primary rate needs to be reviewed for adequacy. Exploration into giving the NFIP some authority to enforce appropriate construction to reduce risk or eliminate risk (by relocating

homes/communities). In our opinion, simply renewing the current process is not a sustainable option.

Evacuation

During winter storms, weather forecasts may trigger evacuation of areas threatened by flooding or landslide susceptibility where precipitation is persistent. Despite the advantage of forewarning, existing social conditions in the evacuation areas can determine the success of an evacuation procedure. Our analysis of the ARkStorm scenario identifies some of the social conditions that could create evacuation challenges caused by flooding in the Inland Region and two additional delta counties: Contra Costa and Solano (Fig. 57). First we estimated the number of people in the flooded areas in the Inland Region and the two additional Delta counties, then we examined social variables that have complicated other massive U.S. evacuations and analyzed these variables in the ARkStorm flooded areas, and finally we applied the HAZUS-MH formula (Federal Emergency Management Agency, 2010b) for shelter requirements. Estimates of county populations in flooded areas were passed to the economic impact analysis. Future refinement of the evacuation analysis for regional planning purposes will expand the social variables and incorporate other factors that affect evacuation (for examples, elevation, traffic routes, shelters).

POPULATION LIVING IN FLOODED AREAS

We use the number of people living in the flood-hazard zones (designated as flooded in the ARkStorm scenario) as a proxy for evacuation numbers; we assume that these flooded areas are forecast with sufficient certainty and all occupants in flooded areas are evacuated. Typically, some people will refuse to evacuate (for example, because of pets), cannot evacuate (for example, because of disabilities), or try to hold out. Our estimate of people living in the flooded area indicates the order of magnitude of an ARkStorm scenario evacuation.

Review of contemporary newspaper coverage of previous storms with flood-related evacuations (James Carter, USGS, 2010, written commun.) revealed the following:

- A total number of evacuees for the 1861-62 storms was not reported, but some accounts tell of 6-7 families sharing houses and 60 people residing in one room. Boats were “slapped together” in response to a scarcity of boats for evacuation.
- In 1938, apparently tens of thousands of people were evacuated.
- In 1969, helicopters evacuated sick and aged in isolated foothill areas.
- In 1986, about 45,000 people were reported to have evacuated.
- In 1997, the number of evacuees was on the order of 125,000 people.

The largest evacuation in the United States was in 2008 when over 3 million people were evacuated because of Hurricane Gustav (Global Risk Miyamoto, 2009). In 2005, the number of people older than 16 years old who evacuated from Hurricane Katrina was about 1.5 million according to U.S. Bureau of Labor Statistics (Groen and Polivka, 2008). Another important meteorological event was Hurricane Rita (2005). The emergency office in Harris County (Texas) envisioned an evacuation of 0.8-1 million people, but more than 2.5 million people fled from that county of 3 million citizens (Victoria Transport Policy Institute, 2006).

In order to obtain the number of people living in ARkStorm scenario flooded areas (Table 17; Figure 57), we used the ESRI 2009 projections of census-block population (table 17; fig. 57). (The projection is relative to the United States Census 2000.) For blocks that were partially flooded,

we calculated the proportion of the block population in the flooded area by using the National Land Cover Data (NLCD) of 2001. In partially flooded census block areas we calculated the area in high, medium, and low intensity of development and the proportion of developed land that was flooded. We assumed that the proportion of people living in flooded areas corresponds to the proportion of the developed area that is flooded. Our intent with this procedure is to avoid counting population that is concentrated outside of the flood zones. Despite the 8 years of difference between ESRI 2009 projections and the 2001 NLCD, we justify use of this procedure with the observation that most of the partially flooded blocks are located in rural areas, where population tends to be dispersed with no major changes in the distribution of growth in recent years. Thus, we estimate that 1.5 million people[13] reside in the flooded areas of the ARkStorm scenario. Most of these people are concentrated in Sacramento and San Joaquin Counties, but Sutter County has the highest percentage (97 percent) of population living in a flooded area. These 1.5 million people represent about 20 percent of the population in the evacuation study area and even though we cannot affirm that all these people would need to evacuate in the ARkStorm scenario, previous events like Katrina and Gustav have demonstrated that evacuations around this size will require federal, regional, and state resources beyond the county capacity.

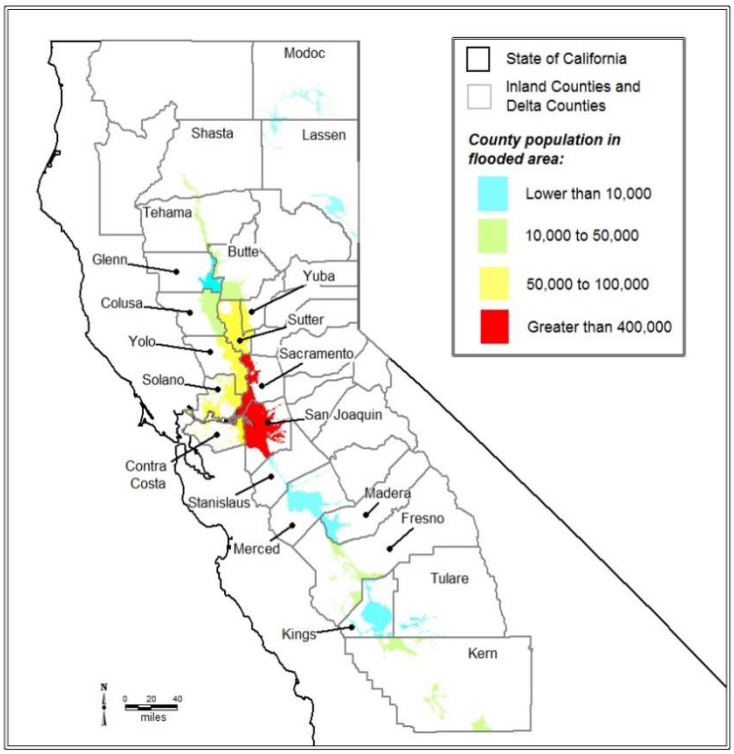


Figure 57. Estimates of number of people, per county, in areas flooded by the ARkStorm. Blue is fewer than 10,000 people, red is more than 400,000.

[13] Using the proportion of area flooded as the proportion of the population in flooded areas raises the total flooded population estimate by another 100,000 people.

Table 17. Estimates of county population living in flooded areas.

County	Estimated 2009 population	People in flooded area	Population in flood area, in percent
Butte	221,957	33,467	15.08
Colusa	22,162	10,101	45.58
Contra Costa	1,063,951	85,445	8.03
Fresno	936,063	11,828	1.26
Glenn	29,084	3,424	11.77
Kern	830,563	22,020	2.65
Kings	155,116	9,632	6.21
Lassen	36,131	2,032	5.62
Madera	153,361	2,197	1.43
Merced	258,323	5,295	2.05
Modoc	9,662	1,197	12.39
Sacramento	1,432,760	527,885	36.84
San Joaquin	692,792	480,106	69.30
Shasta	183,135	22,043	12.04
Solano	426,258	76,486	17.94
Stanislaus	528,982	1,488	0.28
Sutter	97,353	94,024	96.58
Tehama	63,516	10,656	16.78
Tulare	440,882	1,755	0.40
Yolo	202,429	80,689	39.86
Yuba	75,240	56,262	74.78
Regional total	7,859,720	1,538,032	19.57

In addition to the aforementioned assumptions, we were unable to distinguish depth of flooding less than 3 feet. HAZUS methodology suggests that 1 foot is a threshold flood depth for the floatation of cars (Federal Emergency Management Agency, 2010b). On the other hand, other causes for evacuation besides flooding such as landslides, utility (water and power supply) outages and environmental conditions (for example, sewage back up) were not considered. Therefore, the number of people in the flooded areas likely overestimates flood induced evacuation while neglecting other causes for evacuation.

SOCIAL INDICATORS

According to studies of past evacuations (Cabinet Office Civil Contingencies Secretariat, 2006) and (Victoria Transport Policy Institute, 2006), social variables affect the ability of people (as individuals and groups) to evacuate. We analyzed some of those variables that are supported by census block data from the 2009 ESRI projections and the 2000 Census (for English speaking only). The social indicators were defined and justified as follows:

Population: Evacuations in more populated areas are more prone to problems associated with coordination of evacuees, traffic jams, mobilizing people with special needs, shelter availability and public transportation. The population indicator is measured as the number of people living in flooded areas of each census block. The population data are from the ESRI 2009 projection.

Age: A person's ability to evacuate depends on physical self-sufficiency. Research has shown that the majority of deaths during emergencies occur in people older than 65. For example, 66 percent of the fatalities associated with Hurricane Katrina were older than 65 (Louisiana State

University, 2005). Also, in most cases when a large-scale evacuation is taking place, the senior population suffers the majority of the consequences. They get left behind by their caretakers, families, and even the authorities do not plan for their particular conditions or impediments (Cherry and others, 2009). For our analysis, the age indicator is the percentage of people over the age of 65 years in census blocks with flooding. The data for this statistic were taken from the ESRI 2009 projections.

Income: Per capita income is an indicator of mobility in an evacuation in two ways. First, income represents a capacity to afford services, for example, renting a car or staying in a hotel for a long period during an emergency. Second, people with higher incomes have better access to private transportation (own cars). Those with lower incomes tend to rely more on public transportation.

Our income indicator is per capita income by block. We obtained these data from the ESRI 2009 projections that are based on the block Per Capita Income of 2000.

Population density: The population density indicator highlights the more densely inhabited census blocks with flooding. Various studies such as Committee on Role of Public Transportation (2008) and American Highway Users Alliance (2006) reveal several factors that influence evacuation procedures and timing; population density is among these factors. Also, areas with high density tend to be located in urban areas where poverty is more concentrated. Consequently, people in high-density areas may need more assistance with evacuation.

Population density by definition is the census block population (ESRI 2009 population estimate) divided by the horizontal projected area of the block.

Diversity: The relationship between ethnic minority groups and response to an evacuation warning is a subject of research (Sorenson and Sorenson, 2006). In general, studies suggest that minority groups are less likely to evacuate, but Perry (1987) suggests that warning belief and personal risk are stronger determinants of evacuation compliance. However, he also notes that some minority groups perceive authority figures—particularly those from the government—differently from majority groups. In this case, a greater effort is required to accommodate more minority groups into an evacuation plan.

We use the Diversity Index (D.I.) formulated by ESRI that measures the diversity of races/ethnicities of people in a block. The D.I. ranges from 0 (no diversity, the population is comprised of a single ethnic group or race) to 100 (complete diversity, each member of the population is from a different ethnic group or race). By way of example, the U.S. Diversity Index of 61 means that there is a 61 percent probability that two people randomly chosen from the U.S. population belong to a different ethnic group or race (Environmental Systems Research Institute, Inc., 2009). Therefore, a block with a high D.I. has a variety and a balance of races/ethnicities. It is important to clarify that this indicator describes diversity and not the dominant presence of a specific ethnic group or race. The non-English speaking component of minority groups is isolated in the language indicator.

Language: Another major factor affecting evacuation compliance is language. Local authorities need to be aware of the languages spoken in their communities and potential language barriers. For example, the majority of people that died in the 1987 Saragossa Tornado in Texas were Hispanic and this outcome was attributed to a failure to provide a good translation of the warning into Spanish (Aguirre and others, 1991).

For the language indicator, we used English-speaking data from the Census 2000; we calculated the percentage of people in each block that did not speak English at all or were described to have “low English skills”.

Evacuation vulnerability index: In anticipation of summing the indicators to highlight census blocks that may be relatively more challenged by an evacuation, we normalized the data for each indicator by dividing each value by the maximum value for that indicator. Subsequently, for each block we added the normalized indicators and divided the result by 6 (number of indicators) to create an evacuation index that encompasses all 6 indicators. We mapped each indicator and evacuation index by using quantiles (table 18). The lowest (highest) values represent low (high) presence of that indicator. The evacuation index is calculated for the study region, but mapped for three zones (figs. 58 through 60) to display more detail.

Table 18. Scaling of social indicators for social vulnerability index.

Range/Percentiles	Quantile/Value	Description
No datum presence	0	No data
Lower 20th	1	Very low
21st to 40th	2	Low
41st to 60th	3	Medium
6 1st to 80th	4	High
81st to 100th	5	Very high

To capture the interaction between the social variables and severity of flooding, we scaled the flood variables of depth and duration by normalizing the data of each flood indicator (table 19), summing the results, and mapping the top 40 percent of the values to produced a spatial layer of more severe flooding—characterized by greater depth and longer duration. These areas with more severe flooding are shown in black shading (figure 56 through figure 59) to visualize the spatial relation between areas with a high evacuation index and areas with more severe flooding. Note that the flood variables are not incorporated into the evacuation index.

Table 19. Indicators for flood variables used in scaling of social vulnerability.

[<, less than]

Depth (feet)	Duration (days)
<3	<0.5
3 - 10	0.5-3
10 – 20	3-7
	3-14
	14-28

Our social variables are similar to those used by social vulnerability researchers. Our set of evacuation variables includes the four social vulnerability variables (income, diversity, age, and density) that explain most of the social variation in Burton and Cutter (2008). These authors also consider gender, number of renters, and number of medical services in the (larger) census tracts of a similar study region. Wood and others (2010) include employment as well as gender and housing in their analysis of social vulnerability. However, there are some differences between social vulnerability and factors that complicate evacuation: for example, typically female heads of household are considered to be more socially vulnerable yet females are more likely to evacuate than males (Bateman and Edwards, 2002). Although more sophisticated social indices exist (Wood and others, 2010), this simple approach was achievable in the time frame of this first report on the ARkStorm scenario. The method serves to highlight the coincidence of social variables that make evacuation more difficult and raises questions about the spatial variability of social characteristics.

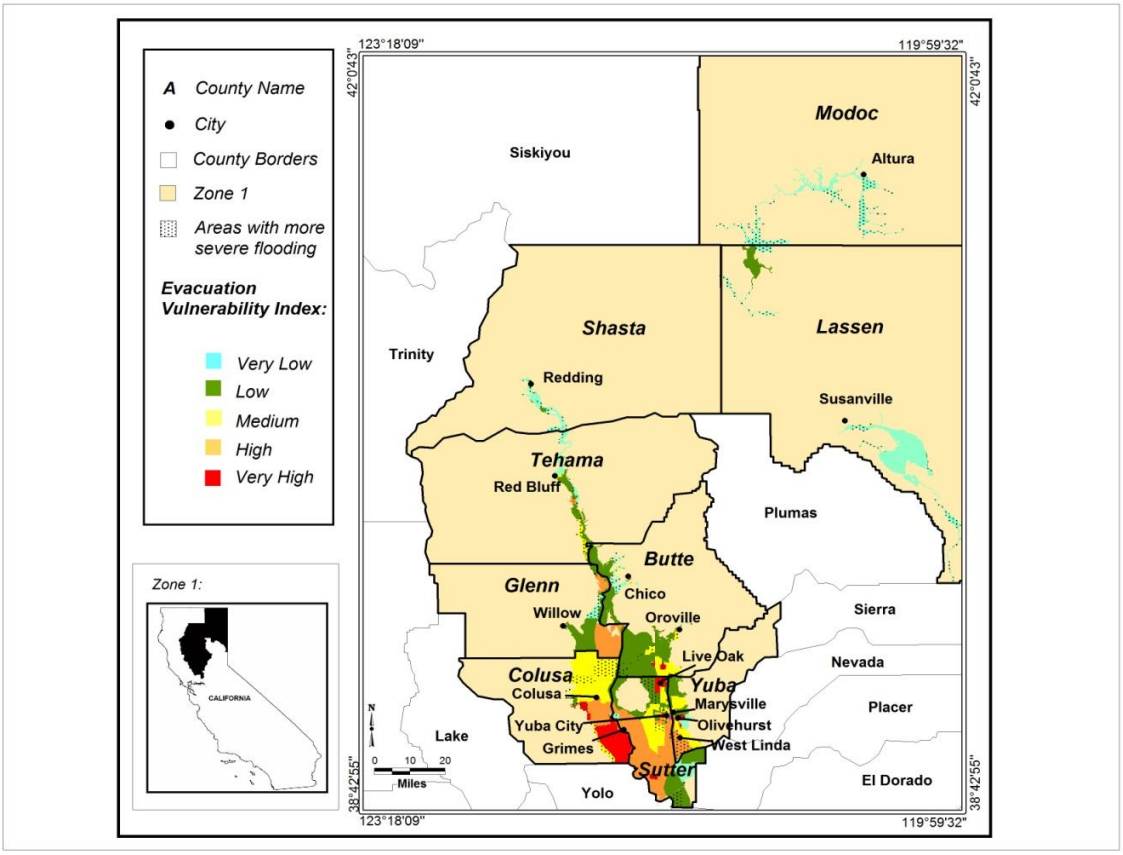


Figure 58. Evacuation vulnerability index in northern inland region (Zone 1).

Figure 58 shows high evacuation vulnerability indices in Sutter and Colusa Counties. The red zone in Colusa (next to Grimes) is a result of a high percentage of people with no or poor English skills, low incomes, and high diversity. The agricultural area in Sutter County (orange evacuation index) contains high percentages of people with no or poor English skills and low incomes. Sutter County is a low-density area, but all the other indicators (population in the flood area, percentage of people over 65 years old, and diversity) score medium or higher.

We also observe that the county seats of Sutter (Yuba City) and Yuba (Marysville) Counties are surrounded by areas with a very high and high evacuation index.

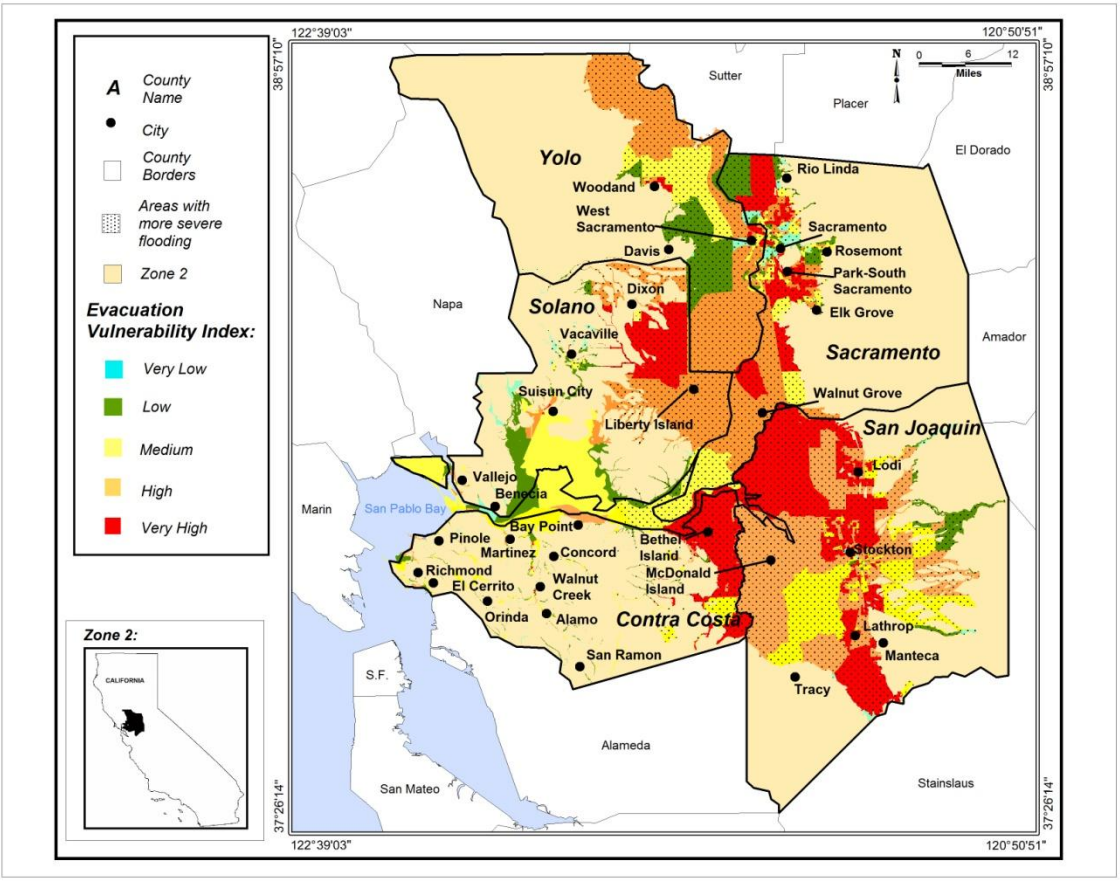


Figure 59. Evacuation vulnerability index in Delta counties (Zone 2).

In Zone 2 (fig. 59) the majority of areas with a high evacuation index coincide with more severely flooded areas. The Sacramento-San Joaquin Delta area is lower lying land with a higher density population accounting for 81 percent of the population considered here. The larger and less densely populated areas with a high evacuation index are located inside the delta area (Bethel, McDonald, Liberty, and Ryer Islands and others such as Jersey, Venice, and Woodward Islands) where residents have medium incomes, no or poor English skills and high diversity.

Two main cities of San Joaquin County (Stockton and Lodi) contain blocks with high and very high evacuation indices. These areas present a high number of people in a flood area, high percentage of people with no or poor English skills, high population density, and high diversity, while the percentages of people over 65 or with low incomes scored between low and medium.

Sacramento is surrounded by areas with low, medium and high evacuation indices. The areas evaluated as high have a high number of people, high population density, high diversity, and low incomes. In contrast, the areas with a low evacuation indices contain people with high incomes, low diversity, and high English skills.

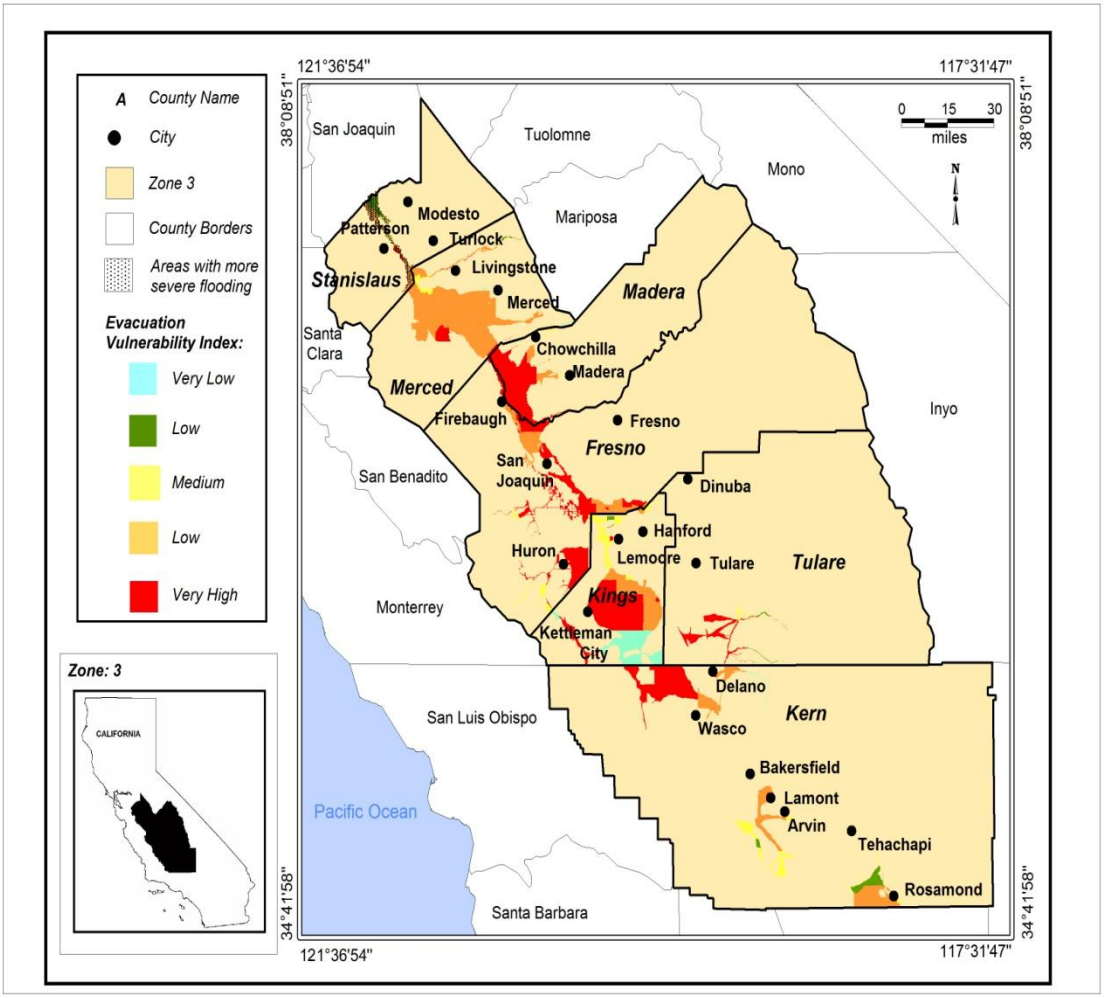


Figure 60. Evacuation vulnerability index in southern inland region (Zone 3).

Zone 3 (fig. 60) exhibits the smallest amount of area with severe flooding. These areas are northwest of the zone. We identify two main areas of high evacuation indices. The first area is next to Firebaugh City. Blocks in this area contains a high percentage of people with poor English skills, high diversity, and low income while the number of people, and percentage of people over 65 years old scored lower (values between 2-3). Density score was very low (1). Kettleman City blocks contain a high percentage of people with no or poor English skills and low income while the number of people, percentage over 65 years old, and diversity fluctuated between 1and 3. Again, density scored the lowest possible value of 1.

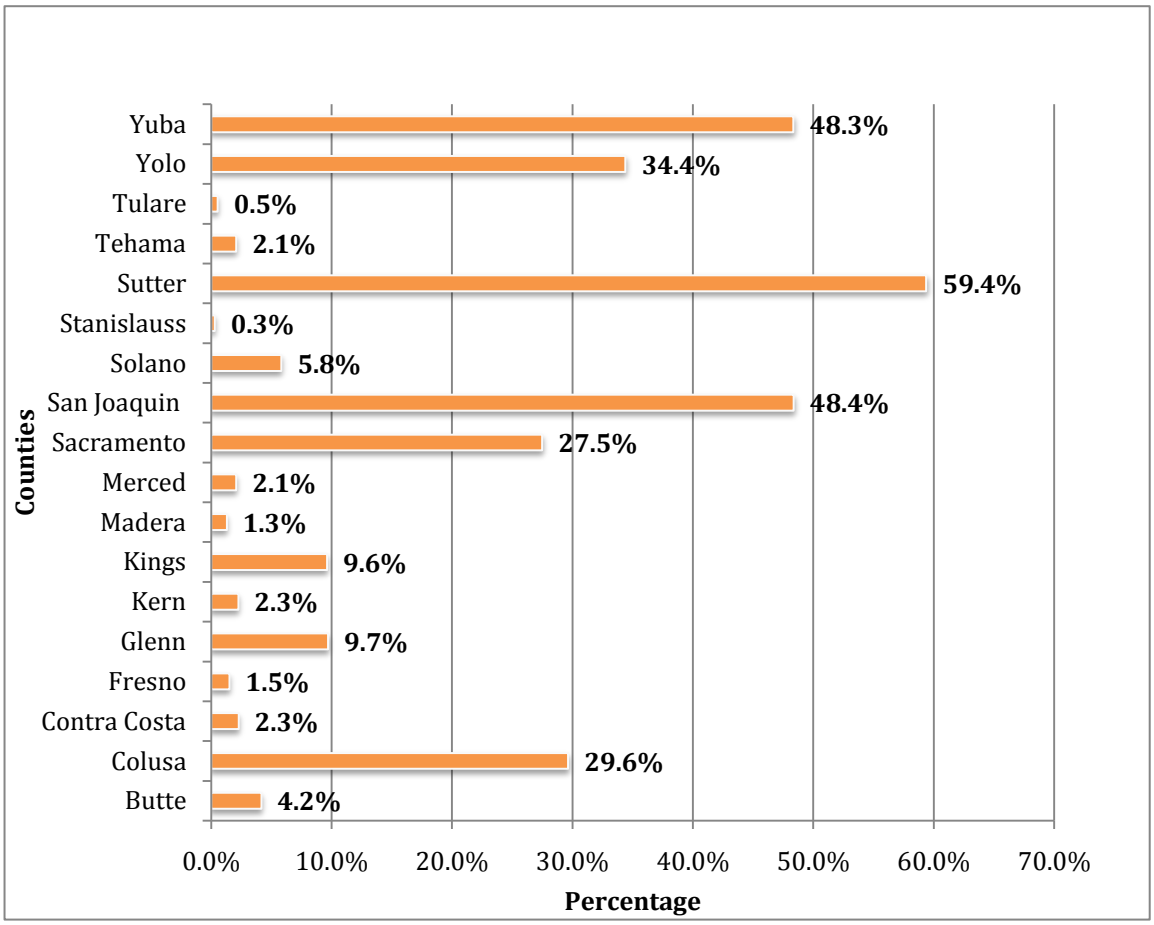


Figure 61. Percentage of people in top two quantiles of the evacuation index relative to the total population (2009) by county.

By way of summary, Figure 61 displays the percentage of people living in the flooded blocks with high and very high evacuation indices for each county. Except for Contra Costa and Solano Counties, the counties with the larger populations in flooded areas (table 17) also have a higher percentage of people living in blocks with high evacuation vulnerability according to our index. Consequently, both San Joaquin and Sacramento Counties have high absolute (over 300,000 people in both counties) and relative numbers of people residing in blocks with high evacuation indices. However, the less populated Colusa County also has a high percentage of people in the top two quantiles of the evacuation index. It is no surprise that Sutter County has the highest percentage of population in blocks, with high and very high evacuation indices, because 97 percent of the county population is in the ARkStorm flooded area.

SHELTER REQUIREMENTS

We estimated the number of people who may need temporary shelter after ARkStorm by using methods in the HAZUS®MH MR4 technical manual (National Institute of Building Sciences and Federal Emergency Management Agency, 2010). This formula takes into account the following factors:

- Low income families that lack the means to find other shelter on their own.

- Young and elderly families that may have the means of finding temporary shelter on their own, but prefer to use publicly provided shelters.

The formula to calculate the number of people with shelter needs is the following:

$$STP = \sum_{k=1}^{5} \sum_{m=1}^{3} akm \cdot DP \cdot HI_k \cdot HA_m \quad (4)$$

where

STP= number of people using established shelters

DP= Displaced population

αkm= Constant for income and age class

HI_k= Percentage of population in the kth household income class

HA_m= Percentage of population in the mth age class

The 2009 income data were provided by the ESRI projections. The age data are from the 2000 census because the 2009 ESRI projection age data were not available.

Table 20. Estimates, per county, of numbers of people in flood area. Includes number and percentage of those needing short-term shelter.

County	Estimated total people in flood area	Estimated number of people in need of short-term shelter	Percentage
Butte	33,467	4,767	14.24
Colusa	10,101	1,298	12.85
Contra Costa	85,445	10,227	11.97
Fresno	11,828	1,942	16.42
Glenn	3,424	257	7.51
Kerns	22,020	2,787	12.66
Kings	9,632	561	5.82
Lassen	2,032	257	12.65
Madera	2,197	468	21.30
Merced	5,295	740	13.98
Modoc	1,197	147	12.28
Sacramento	527,885	76,073	14.41
San Joaquin	480,106	76,118	15.85
Shasta	22,043	3,022	13.71
Solano	76,486	9,899	12.94
Stanislaus	1,488	272	18.28
Sutter	94,024	10,399	11.06
Tehama	10,656	1,658	15.56
Tulare	1,755	418	23.82
Yolo	80,689	11,502	14.25
Yuba	56,262	7,509	13.35
Total	1,538,032	220,321	14.32

The results in table 20 suggest that 8 percent (125,022) of the population in the Inland Region and Contra Costa and Solano Counties may need shelter in the short-term. San Joaquin and Sacramento County residents are in greater need of short-term shelters for about 100,000 people, representing 84 percent of all shelter needs. The concentration is caused by the combination of two main features of these counties: a large number of people residing in the flooded area (table 17) and a relatively high percentage of lower income population. (As another point of reference, according to the 2000 Census, 18 percent of San Joaquin and 14 percent of Sacramento County residents were living below the poverty line.)

RESEARCH NEEDS RELATED TO EVACUATION

For census blocks with partially flooded areas, further refinement of flooded population estimates can be accomplished by identifying important features of the residential population. For example, Solano County has a high number of people living in houseboats. These people may not need to be evacuated. Also additional variables like car ownership and household gender could be considered to further inform the spatial variability of evacuation issues. Another key variable affecting people's ability to evacuate is the number of people with disabilities and health issues. The Flood Emergency Action Team (FEAT) final report (California Department of Water Resources, 1997) concluded that warnings and shelters were not accommodating of people with disabilities. The location of people with disabilities and health issues is not readily available and is challenging to keep current. The Sacramento County evacuation plan (Sacramento County, California, 2008) describes various strategies for locating, alerting, and warning this vulnerable population. Elsewhere, the Florida ADA Hurricane and Disaster Center has partnered with the Center for Independent Living of Southwest Florida and emergency preparedness officials to track this information in four Florida counties (Cahalan and Renne, 2007).

An additional consideration is public transportation as an asset for massive evacuation. Issues around transportation are well illustrated by Hurricanes Katrina and Rita. -"If Katrina exposed what happened when many people have no cars to evacuate; Rita seemed to show the other side of the coin"- (Victoria Transport Policy Institute, 2006). During Katrina, the demand for transportation was massive, but the city was not ready for such demand. The lack of planning and concrete strategies for people with no private transportation provoked the public to take over infrastructures that were not designated to become shelters. Also, many people with special needs for transportation were left behind, increasing the number of fatalities. In contrast, during Hurricane Rita, emergency managers in Texas expected people in coastal areas who owned boats to take the boats with them by trailer and cause additional congestions on the roads. However, they had not anticipated families using all their cars to evacuate (rather than take one car per family) and in some cases residents took trailers and horse trailers as well. This evacuation led not only to very heavy congestion on the road but also to a shortage of gas (Cabinet Office Civil Contingencies Secretariat, 2006). Public transportation is an asset and is key to a successful evacuation, but the challenges include overcoming the stigma of public transportation, improving efficiency, identifying rally points, and educating residents (Victoria Transport Policy Institute, 2006). Overall, evacuation planning needs to consider a range of public services for the evacuees (such as gas stations, supermarkets, health care, public buses) and the management and retention of staff for those services.

The evacuation analysis can be enhanced with considerations of public infrastructure, location of shelters and dams, and options for public transportation.

Elevation data can be used to identify suitable shelter sites. Integration of various spatial information will be useful for regional evacuation planning. One example of spatially integrated information at the local level is the evacuation mapping designed by Baldwin (2010) for San Joaquin County.

Finally, a concern of CalEMA is the level of complacency about evacuation in California (D. Owens, CalEMA, 2010, personal commun.). In contrast to the Gulf States, the residents of California are not routinely faced with flooding and evacuation warnings and orders. Tendencies to ignore official warnings and wait until the last minute to evacuate will put more people at risk. Changing passive perceptions toward flooding evacuations is a challenge for emergency managers because people's risk attitudes and beliefs is what makes evacuation a reality.

Business Interruption Costs

INTRODUCTION

This section summarizes business interruption (BI) impacts of the ARkStorm Scenario. These impacts stem from a combination of damage to buildings, agricultural lands, and several types of infrastructure. Our BI estimates include not only direct impacts at the site of the damage but also indirect BI stemming from interdependencies among and between businesses and households throughout the economy.

Our direct BI estimates are based on calculations of loss of building function, loss of productivity on agricultural land, reduction of lifeline services from damaged infrastructure, and a reduction in the labor force because of evacuation. These estimates are translated into decreases in the capital stock or direct declines in output, as appropriate, into 100 sectors of the economy.

Our indirect BI losses are based on the application of a dynamic computable general equilibrium (CGE) model of the California economy. CGE is a state of the art economic tool that is based on the behavioral response of representative producers and consumers to market price signals within the limits of available capital, labor, and natural resources (Shoven and Whalley, 1992). CGE captures both technical interdependence between sectors in terms of input linkages and also market actions and interactions through prices. The dynamic feature links the 6-month time periods in the model (appendix B). CGE models are increasingly being used in disaster context (Rose and Liao, 2005; Rose and others, 2009; Dixon and others, 2010). This study further advances the methodology for application to disasters.

HAZARD LOSS ESTIMATION

BASIC CONSIDERATIONS

For many years, hazard loss estimation was dominated by engineers, and accordingly the focus was on property damage to structures. Other types of impacts (whether economic, sociological, psychological) were combined in a grab bag category termed "indirect" or "secondary" losses. By the mid-1990s, there was a growing appreciation of the role of business interruption (BI) losses, which refer to the reduction in the flow of goods and services produced by property (capital stock). This stock/flow

distinction is a basic concept in economics and, in fact, flow measures, such as Gross National Product (GNP), have long held a dominant position.

Direct and indirect versions of both categories of losses are prevalent. Direct property damage relates to the effects of flooding, winds, and landslides; while collateral, or indirect, property damage is exemplified by toxic releases from HAZMAT facilities (those in the EPA facility registry system) damaged by flood debris. Such indirect property damages have been identified under environmental and health issues in this report, but we have not been able to evaluate the economic impacts of them. Direct BI refers to the immediate reduction or cessation of economic production in a damaged factory or in a factory cut off from at least one utility lifeline. Indirect BI stems from the interdependencies of the economy in the form of "multiplier" effects associated with the supply chain or customer chain of the directly affected business or through the general equilibrium effects of market interactions. Rose (2004a) explains these concepts and Rose and others (2009, National Research Council (2005, Multihazard Mitigation Council (2005a, 2005b), and European Union (2003), provide examples of the application.

An important consideration is that nearly all direct property and ancillary (or indirect) property damage takes place during the time span of the winter storm. An exception is damage from deep seated landslides: while some landslides, triggered by the heavy rainfall season including the ARkStorm, will begin to move during or shortly after the storm they may continue to move for months or years. Furthermore, other deep-seated landslides may not begin to move until weeks or months following the storm. BI, being a flow variable, manifests over a longer time period than storm related damage. BI begins when the damages from flooding, wind, and landslides occurs and continues until the built environment is repaired and reconstructed to some desired or feasible level (not necessarily predisaster status) and a healthy business environment is restored. As such, BI is complicated because it is highly influenced by the choices of private and public decision makers about the pattern of recovery, including repair and reconstruction. As in the ShakeOut scenario (Rose and others, written commun.; Jones and others, 2008,), the aggregate magnitude of BI can rival that of property damage. Also, technological progress implies that, over the long run, reconstruction investment that replaces old, less efficient capital with new, more efficient capital may generate a temporary increase in the aggregate productivity of capital and pay positive dividends offsetting some loses in the long-run.

More recently, the loss estimation framework has been expanded in two ways, and the term economic consequence analysis is being used to distinguish this breadth (Rose, 2009). First is the incorporation of the loss reduction strategy of resilience, in both static and dynamic forms. We define static economic resilience as the ability of an entity or system to maintain function (continue producing) when shocked by the types of disruptions accounted for in this scenario (Rose, 2009; 2004b;). Static economic resilience is thus aligned with the fundamental economic problem of efficient resource allocation, which is exacerbated in the context of disasters. This aspect is interpreted as static because it can be attained without repair and reconstruction activities, which affect not only the current level of economic activity but also its future time path. Another key feature of static economic resilience is that it is primarily a demand-side phenomenon involving users of inputs (customers) rather than producers (suppliers). This is in contrast to supply-side considerations, which definitely require the repair or reconstruction of critical inputs. A more general definition of dynamic resilience is the speed at which an entity or system recovers from a severe shock to achieve a desired state. This also subsumes the concept of

mathematical or system stability, as it implies the tendency of the system to "bounce back". This version of resilience is relatively more complex, because it involves a long-term investment problem associated with repair and reconstruction. Production may be affected by building damages, reduced lifeline services, and absent employees.

The second major consideration is extended linkages. One type is systems linkages, such as cascading infrastructure failures. Another is behavioral linkages, which refer to considerations like the effect of recent disasters on risk attitudes (Burns and Slovic, 2007). A good example is the fact that 85 percent of the BI loss following 9/11 stemmed from the nearly 2-year decline in air travel and related tourism because of heightened fear of flying (Rose and others, 2009). Note this category also has associated indirect effects. Thus it can increase BI losses by one or two orders of magnitude. In the following analysis, we take these various considerations into account to the extent possible within project limitations. Throughout our modeling, we carefully distinguish stock from flow effects and direct from indirect losses. We factored in BI associated with interdependent infrastructure failures. We included some major sources of resilience in the aftermath of disasters relating to static resilience strategies of substitution responses to price signals, the ability to recapture lost production through overtime or extra shifts, and the fact that not all aspects of economic activity require infrastructure inputs. However, we were not able to factor in behavioral linkages.

CONDUITS OF ECONOMIC SHOCKS

We analyze the following conduits of shocks to the economic system stemming from damages to the built environment (Actual damage is not necessary in all cases to cause economic loss. Evacuation prior to disaster can cause even greater BI losses than a small version of the event. Also, some buildings can be closed for business because of proximity to damaged buildings. Some infrastructure services may be shut down as a precautionary measure as well.):

- Direct building and content damage from flood
- Direct building damage from wind
- Direct damage to crops, fruit and nut trees, and agricultural lands
- Direct lifeline service outages for:
  - Electric power systems
  - Water systems
  - Wastewater treatment systems
  - Highway networks
  - Telecommunication systems
- Evacuation

An important additional consideration is the need to adjust for double-counting of the channels of losses. That is, a factory may suffer from a flooded first floor and loss of electricity simultaneously, either one being enough to cause it to shut down business operations. Our analysis does adjust for possible double-counting.

Finally, we note that our results could be presented in terms of several economic impact indicators. We first present them in terms of property damage (loss of asset values). We also calculate the results in terms of two types of flow variables relating to BI. The first is value added, a net measure that corresponds only to the cost of primary factors of production (labor, capital, and natural resources, and excludes the cost of intermediate, or processed goods). The second is Gross Domestic Product (GDP), which differs only slightly from value added by including some taxes. GDP at the state level is sometimes referred to as Gross State Product (GSP. The term "Gross" here refers to the fact that depreciation (wear-and-tear or obsolescence of fixed capital assets) is included, although intermediate goods are not.)

THE DYNAMIC COMPUTABLE GENERAL EQUILIBRIUM MODEL

A CGE model is a stylized computational representation of the circular flow of the economy (Shoven and Whalley, 1992). CGE solves for the set of commodity and factor prices and the set of activity levels of outputs from firms and household incomes that equalize supply and demand across all markets in the economy (Sue Wing, Boston Univ., written commun., 2009). The model developed for this study divides the California economy into 100 industry sectors, each of which is modeled as representative firm characterized by a constant elasticity of substitution (CES) technology to produce a single good or service. Households are modeled as a representative agent with CES preferences and a constant marginal propensity to save and invest out of income. The government also is represented in a simplified fashion. Its role in the circular flow of the economy is passive: collecting taxes from industries and passing some of the resulting revenue to the households as a lump-sum transfer, in addition to purchasing commodities to create a composite government good which is consumed by the households. Three factors of production are represented in the model: labor—which responds to changes in the wage rate, and two types of capital—intersectorally mobile, and sector-specific varieties of capital. These factors are owned by the representative agent and rented to the firms in exchange for factor income. California is modeled as an open economy that engages in trade with the rest of the U.S. and the rest of the world by using the Armington specification (imports from other states and the rest of the world are imperfect substitutes for goods produced in the state).

The static component of the model computes the prices and quantities of goods and factors that equalize supply and demand in all markets in the economy, subject to constraints on the external balance of payments. This equilibrium submodel is embedded in a dynamic process, which on a 6-month time-step specifies exogenous improvements in firms' productivity and updates the capital endowments of the economy based on investment-driven accumulation of the stocks of capital. The impacts of a severe storm are modeled as exogenous shocks to the productivity of industries, and contemporaneous destruction of capital stock, with concomitant reductions in the California economy's endowments of malleable and sector-specific capital input.

The model is formulated as a mixed complementarity problem using the MPSGE subsystem for the General Algebraic Modeling System (GAMS) software (Rutherford, 1999; Brooke and others, 1998) and is solved by using the PATH solver (Ferris and others, 2000). A more detailed and technical presentation of the model is presented in appendix B. The model is calibrated by using an IMPLAN social accounting matrix for the state of California for the year 2007 (Minnesota IMPLAN Group, 2006 in conjunction with values of the

elasticities of substitution and transformation drawn from Rose and others, (2009) and Rose and Liao (2005). The latter parameters are summarized in appendix B, which also provides a list of the sectoring scheme.

We model the consequence of the imposition of the storm's shock as an array of initial declines in sector outputs, which induce intra- and intersectoral substitution adjustments by producers and consumers, as well as changes in the prices of commodities and factors. The result is a new equilibrium with reduced aggregate expenditure and investment, which generates contemporaneous losses of consumer welfare (relative to the baseline solution of the model), and slower growth of the capital stock that adversely affect the economy's capital endowment and productive capacity in subsequent periods. The latter, dynamic impact of the initial capital stock destruction is an important source of hysteresis in the losses caused by a storm. Symmetrically, the principal channel through which repair and reconstruction investments dampen the persistence of losses is the output- and income-enhancing effect of restoring business productive capacity.

METHODOLOGICAL DETAILS FOR INDIVIDUAL LOSS CATEGORIES

In addition to the IMPLAN social accounting matrix, other data are critical for evaluating economic impacts and resilience associated with disasters. These data include inventory data on the built environment (commercial and industrial property, residences, infrastructure) and on the natural environment. Also needed is a set of damage functions that relate changes in underlying conditions to property damage and loss of function. One such source is Hazards United States-Multi-Hazard (HAZUS-MH) System (Federal Emergency Management Agency, 2008a). HAZUS-MH is a large expert system that contains detailed data on the built environment at the small area level, a set of damage functions, and a GIS capability. Physical damage and business interruption are translated into direct dollar values of building repair costs and business downtime costs, respectively.

Estimation of the conduits of business interruption was as follows:

1. **Flood damaged buildings.** The flooded building damage estimates provided to us were calculated by using HAZUS-MH equations. (The HAZUS-MH building inventory was extracted from the HAZUS-MH software because of the size of the problem) The flow of goods and services emanating from damages to this productive capital stock (essentially equivalent to BI losses) is direct "output loss", where output refers to "gross output," equivalent to gross sales revenue. We followed the procedures in Chapter 14 of the HAZUS-MH flood technical manual (Federal Emergency Management Agency, 2010b) to calculate: (1) output losses for nonresidential occupancy classes and nursing homes and (2) rental and owner occupied losses for the remaining residential occupancy classes. We included the HAZUS-MH flooded building downtime add-ons of dry out and cleanup; inspection, permitting and ordinance approval; contractor availability; and hazmat delay. We used HAZUS-MH equations to calculate relocation costs. Flooded buildings and moderately damaged, severely damaged, and destroyed buildings will take longer to restore than the lifeline services, which are mostly recovered within two months. After two months, residual power restoration continues only in Mono, Inyo, and Tulare Counties.

2. **Wind damaged buildings.** Likewise, the building wind damages were provided to us by Keith Porter. We used the procedures in Chapter 7 of the HAZUS-MH Hurricane Technical Manual (Federal Emergency Management Agency, 2010d) to calculate output, owner-occupied dwelling, and rental losses.

3. **Damages to agricultural commodities.** An adaptation of the methodology developed for the Delta Risk Management Strategy (DRMS) (California Department of Water Resources, 2008) was used to estimate agricultural damages. Field repair costs were calculated for annual and perennial crops and livestock. In addition, forgone income was calculated for flooded annual crops; perennial crops flooded for 2 weeks or more incurred crop replacement costs and forgone income for up to 5 years; and the replacement value of livestock (dairies, feedlots, poultry) at risk was estimated in areas with at least 6 feet of flood depth.

4. **Electric Power**. One feature of the computations for most of the infrastructure categories involved is the timing of the disruptions. (For buildings this feature was internal to the HAZUS-MH computations.) The percentage of customers affected by the outages is not constant but decrease over time as services are restored. Like buildings, wind and flood damages to infrastructure were considered. The more dominant cause of damage was identified for each infrastructure in each county. Service reduction and restoration curves were based on panel discussions and expert opinion. Each infrastructure BI impact was simulated separately.

The power restoration pattern (percentage of power services recovered in individual restoration periods) differed by county and ranged from 0.2 percent to 69 percent customers initially out of service with most restored within a month except for a couple of outlier counties needing 6 months to fully restore power to customer base. The power outages were localized to county because generation capacity that is located "high and dry" was not considered to be a limiting factor. Each county restoration curve was transformed into quarterly power shortages for each occupancy class by (1) integrating under the inverse of each county restoration curve to estimate percentage of county customers not served during each quarter, (2) weighting this percentage by the proportion of occupancy class square footage in the county and (3) summing up weighted county power shortages for each occupancy class.

5. **Water.** The estimation of BI losses stemming from disruption of the water system is similar to that of the power system except that flooding was the only cause of damage. Consequently, 42 counties were not affected by water supply disruptions. The remaining counties have disrupted water services to 10-60 percent% of customers with service restored within three months.

6. **Wastewater.** The estimation of BI losses stemming from disruption of the wastewater system is similar to that of the water system. Forty-one counties were not affected by wastewater treatment disruptions. The remaining counties presented disrupted wastewater services to 17-100 percent of customers with service restored within a month.

7. **Telecommunications**. The estimation of BI losses stemming from disruption of the telecommunications system is similar to that of the power system. All counties experience reduced telecommunication services affecting 2 to 25 percent of customers for up to 7 days.

8. **Truck Transportation.** The truck traffic economic impact analysis was conducted outside of the CGE model and is described in a separate section. We obtained technical support from various University of Southern California-affiliated independent consultants coordinated by Hanh Le Griffin of TTW, Inc. Their transportation model analyzes the effects of reduced highway capacities on the regional and national movement

of goods and services by estimating changes in truck distance, travel time, and associated costs and the impacts of increased shipping prices on major economic sectors.

9. **Evacuation.** We were provided with county estimates of population in the ARkStorm flooded areas (based on GIS analysis by using ESRI 2009 population projections). About 1.5 million people reside in the ARkStorm flooded area of the Inland region and Delta counties. We assumed that the effective impact from evacuation extended for the duration of the flooding. IMPLAN county employment data (Minnesota IMPLAN Group, 2006 was used to allocate the evacuated population to sectors, that is, we assumed that the distribution of employment among evacuated residents is the same as the distribution of employment in the county.

RESILIENCE

For the most part this study only addresses aspects of static resilience because we received one restoration time path for each BI conduit and because dynamic resilience, especially for infrastructure, is so strongly dependent on a series of public and private decisions regarding the timing of repair and reconstruction, which are complex and uncertain and hence highly variable. Moreover, only a limited number of static resilience options were incorporated, albeit they are by far the ones that have been found to have the greatest potential for reducing BI losses (Rose and others, 2009).

The primary source of static resilience is "production rescheduling," or the ability of firms to work overtime or extra shifts after they have repaired or replaced the necessary plant and equipment and their employees and critical inputs become available once more such that "loss of function" has been overcome. This is rather straightforward for the case of flood and wind damaged buildings. For infrastructure, it is more complicated. Just because electricity service has been restored does not mean that businesses can immediately turn on the assembly line; they must repair the necessary plant and equipment first (though this need not be 100 percent restoration to be fully operational). HAZUS-MH includes an adjustment for this consideration, referred to as the "Building Service Interruption Time Multiplier" for earthquakes and wind (hurricanes), but an adjustment has not yet been developed for the buildings damaged by flooding. Production rescheduling is incorporated in HAZUS-MH through the inclusion of production "recapture factors" (RFs), scaling parameters that represent the percentage of direct gross output losses that can be recovered at a later date. The original HAZUS-MH RFs range from 0.30 to 0.99. Manufacturing enterprises that produce nonperishable commodities are at the high end, while sectors producing perishables (agricultural) or nonessential services (entertainment) are at the lower end of the scale. These RFs are subject to the caveat that they are applicable only for three months with no effect thereafter. This is meant to reflect the fact that customers and suppliers will grow impatient as their orders go unfilled. Accordingly, we adjusted the HAZUS-MH RFs downward by a linear decay rate of 25 percent for every 3-month period during the first year, so that recapture becomes zero by the second year. In our view, this reflects a more realistic situation in which customers become increasingly impatient over time, canceling larger numbers of orders as delays mount.

The second type of resilience modeled was infrastructure "importance." The term stems from Applied Technology Council-25 (1991), which convened a panel of experts to advance hazard loss estimation. One of the contributions was to identify the percentage of a sector's business operations that does not depend on a specific category of infrastructure.

Thus, even if a lifeline outage occurs, a part of the sector can keep operating. Examples are headquarters offices being less dependent than production lines in general, and some sectors being less dependent than others on lifeline services (the relatively low dependence of agriculture on the delivery of electricity and natural gas through the existing transmission and distribution infrastructure). Typically, the operation of industrial and commercial establishments is dependent on the availability of electricity, water, and natural gas, in that order. Like production rescheduling, this type of resilience also dissipates over time, though in a less dramatic manner. For example, if activities of headquarters or maintenance facilities are disrupted, other business functions may still be able to continue, but eventually inoperable headquarters and maintenance activities will disable the other functions of the enterprise. Unfortunately, no data were available to make adjustments that reflect this additional complication.

Rose (2009, 2004b) has emphasized that resilience has several key dimensions. One is that resilience can take place at the micro (individual business or household), meso (sector), and macro (economy-wide) levels. Another is the distinction between inherent and adaptive resilience. The former refers to features that exist in the economy under normal circumstances. The latter refer to adjustments that arise out of the ingenuity of the situation. A good example of the former is a dual-fired electric generation boiler, so that it is possible to substitute fuel oil for natural gas. An example of adaptive substitution would be to further modify the boiler after the flood to be able to burn waste products.

The market system is a major source of resilience. Price increases signal that resources have become more scarce, and, thereby, have a higher value, and that we should reallocate inputs accordingly. Note, all price increases do not represent gouging, and our CGE model is able to estimate what increases are warranted on the basis of economic efficiency. The CGE model also incorporates substitution possibilities as part of the production function of individual businesses.

Because of a lack of other information, we have often employed scalar or linear relationships to characterize resilience. At the same time, we must acknowledge that there is likely to be a threshold at which even resilience is eroded, beyond which the economic system will be overwhelmed and rendered much less able to return to pre-disaster equilibrium.

ADJUSTMENT FOR MULTIPLE SOURCES OF BUSINESS INTERRUPTION

Many businesses and households will suffer disruptions from many sources. They may simultaneously incur building damage and loss of one or more lifeline services. Thus, each of our estimates when totaled may double-count some impacts—the same business establishment cannot be shut down more than once in any given period. We adjusted for these multiple causes of failure (table 21), using the following procedures:

1. We identify uncorrelated conduits of economic shocks. Building damage because of wind occurs in higher elevation areas and building damage because of flood occurs in lower elevation areas. Therefore, we assume that the impacts from flood and wind building damage are additive (no double-counting). The economic impacts from crop and livestock damages also are treated as additive because they are calculated independently of building damages.

2. We identified additional superfluous lifeline impacts. We observed that the times to restore flood damaged buildings and buildings with moderate wind damage or greater exceed the time to restore power, water, wastewater, and telecommunication services. Therefore, if a flooded building or moderately or severely wind damaged or destroyed building is subjected to lifeline outages, the lifeline service will most likely be standing by to provide service once the building repairs are completed. Therefore, we accounted for the additional economic impacts from lifeline service outages affecting operations in buildings that have no downtime from flooding or are not moderately or severely damaged or destroyed by wind. We estimated these additional economic impacts from lifeline service outages by the following means:

a. First, we compared the percentage of building square footage with longer downtimes than lifeline service restoration times with the percentage of customers affected by each lifeline service outage. Across the building occupancy classes, about 21-36 percent of building square footage have downtimes exceeding lifeline service restoration times. The high technology HAZUS-MH occupancy class (IND 5) is an outlier with 70 percent of building square footage with downtimes exceeding lifeline service restoration times. On average, 25 percent of building square footage have downtimes longer than lifeline service restoration times. Weighted averages of initial lifeline service outages suggest that 12 percent, 16 percent, 21 percent, and 24 percent of building square footage is subjected to water, telecommunications, power, and wastewater service outages, respectively. Therefore, it is possible that all or most lifeline service outages affect buildings with downtimes longer than lifeline service restoration.

b. Second, at the other extreme, we considered the case of equal distribution of lifeline service outages across building square footage such that building damages and lifeline outages are essentially treated as independent of each other. Weighting initial county lifeline service outages with county building square footage, suggests that, on average, 60 percent of the water and wastewater outages could pertain to buildings with downtimes less than lifeline service restoration. Similarly, on average, 75 percent of the power and telecommunications outages could pertain to buildings with downtimes less than lifeline service restoration. The lower percentage for water and wastewater is not surprising given that flooded components of the water and wastewater systems yielded a greater percentage of service outages in those counties with more building flood damage. Thus, additional impacts from lifeline service outages after building damage could be in the range of 0-60 percent of water and wastewater service economic impacts and 0-75 percent of power and telecommunication service economic impacts.

c. Third, we selected a percentage within the above ranges by considering the likely spatial correlation between damaged buildings and lifeline service disruptions. Further data and GIS analysis is needed to assess the distribution of flooded building square footage relative to water and wastewater service areas. In the absence of this information, we surmise that these lifeline service reductions disproportionately affect flooded buildings because flooding is the cause of water and wastewater infrastructure damages. Within the possible range of 0-60 percent of additional economic impacts from water and wastewater outages, we assumed 10 percent of water and wastewater economic impacts qualified as additional. Power service outages, for the northern region at least, were calculated with double counting in

mind (and extended to the whole area for the independent analysis of lifeline service economic impacts). Therefore, we retained 75 percent of the economic impacts from reduced power services. Telecommunication services are restored relatively quickly and thus will have relatively less of an economic impact. Similar to power, we retained 75 percent of the telecommunication economic impacts.

d. Evacuation is correlated with building damages because of flooding. The additional economic impact from evacuation involves those evacuated residents that work outside of the flooded area. We were unable to assess the percentage of evacuees that work outside of the flooded areas; we assumed 50 percent in the absence of this information.

e. California economic impacts from truck traffic affected by reduced capacity on the highways will be constrained by the ability of California industrial sectors to produce commodities (given building damages and other lifeline outages) that are shipped throughout the U.S. However, much of the truck traffic passes through California to and from the ports. We arbitrarily retained 70 percent of the economic impact from truck traffic while noting that the estimated impacts are relatively small compared to the other conduits of shock.

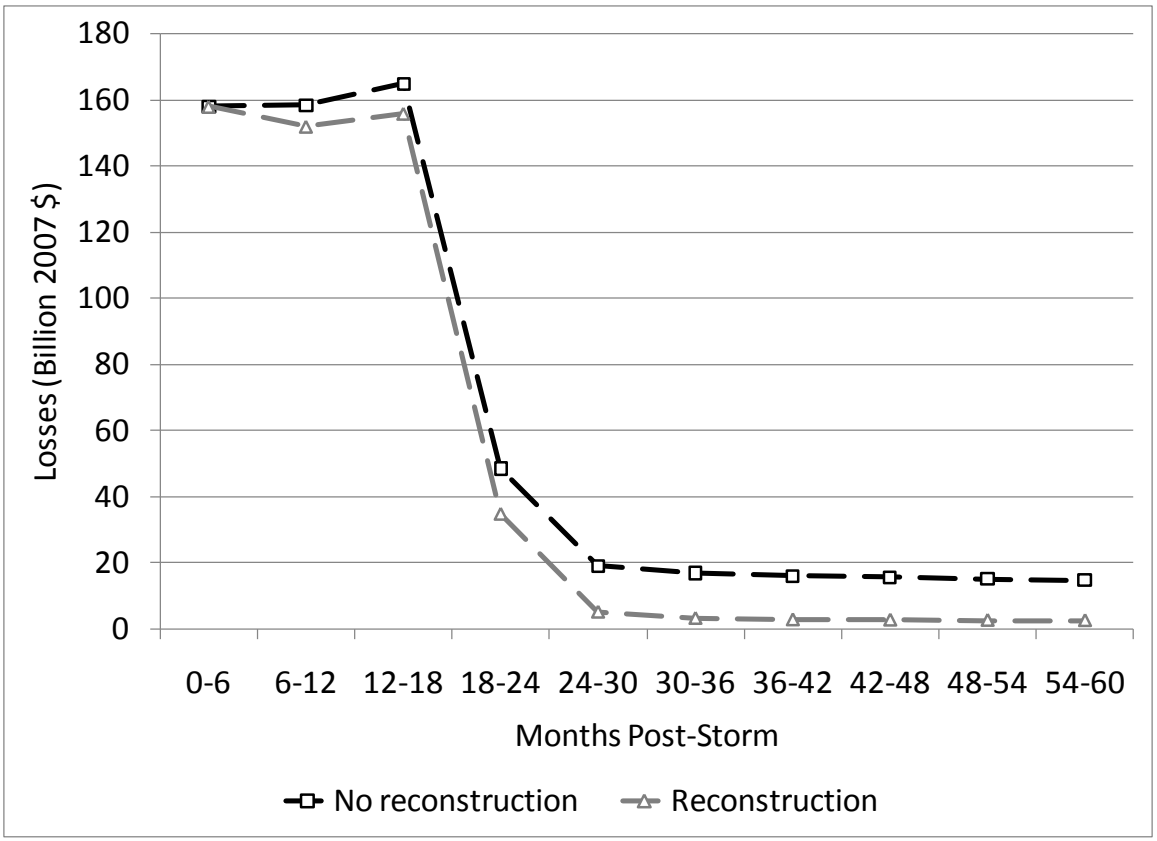
There will be further double counting between the lifeline services (for example, a building does not have power or water services, but we have ignored these as second order effects).

Table 21. Summary of Business Interruption double counting adjustments.
[%, percent]

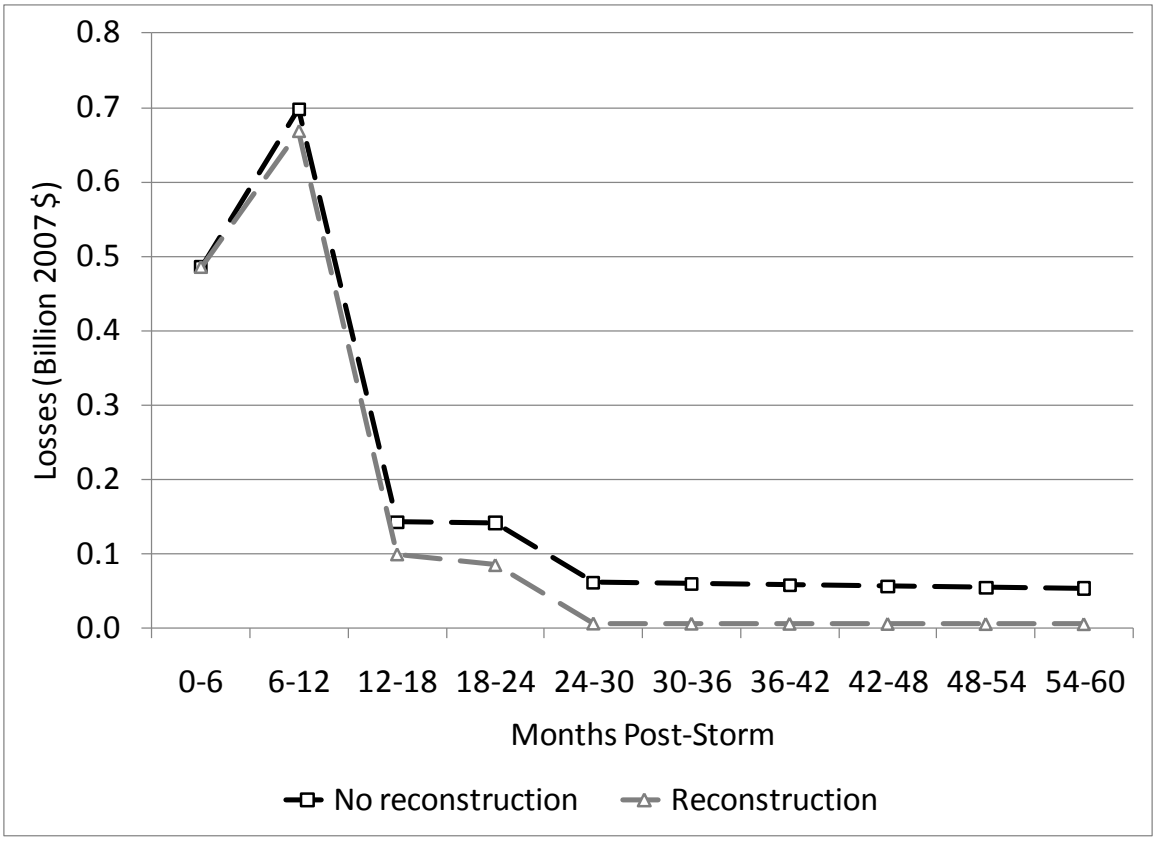
Conduit for Business Interruption	Double Counting Adjustment
Building damages from flooding and wind	Retain 100% of output losses – no adjustment
Agricultural damages	Retain 100% of output losses – no adjustment
Power and telecommunication outages	Retain 75% of output losses to capture economic impact to customers in functional buildings without power or telecommunication services.
Water and wasterwater outages	Retain 10% of output losses to capture economic impact to customers in functional buildings in service areas affected by flooding.
Evacuation	Retain 50% of output losses to capture economic impact from flooded residents working outside of the flooded area.
Highway truck transportation	Retain 70% to capture economic impacts corresponding to truck traffic to and from otherwise operational facilities.
Double counting of lifeline service reduction outside of flood and wind damaged areas	Adjust to zero as a second order effect.

MACROECONOMIC IMPACTS

We summarize the macroeconomic impacts of the ARkStorm Scenario estimated with the use of a computable general equilibrium model of California (appendix B for model details). The value added losses are presented for the pure damage effects and for the case where reconstruction spending is factored in. a In all cases, t The reductions in Gross State Product (GSP) exceed the losses in aggregate value added by 15-20 percent, with the former measure reflecting the attenuating effect of the shock on tax revenues. Looking at the magnitude of impacts as shown in the various panels of figure 62, by far the largest impacts are because of flooding, followed by utility service interruptions, crop losses, evacuation, and finally wind damage.



A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0.5
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0.3
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Losses (Billion 2007 $)
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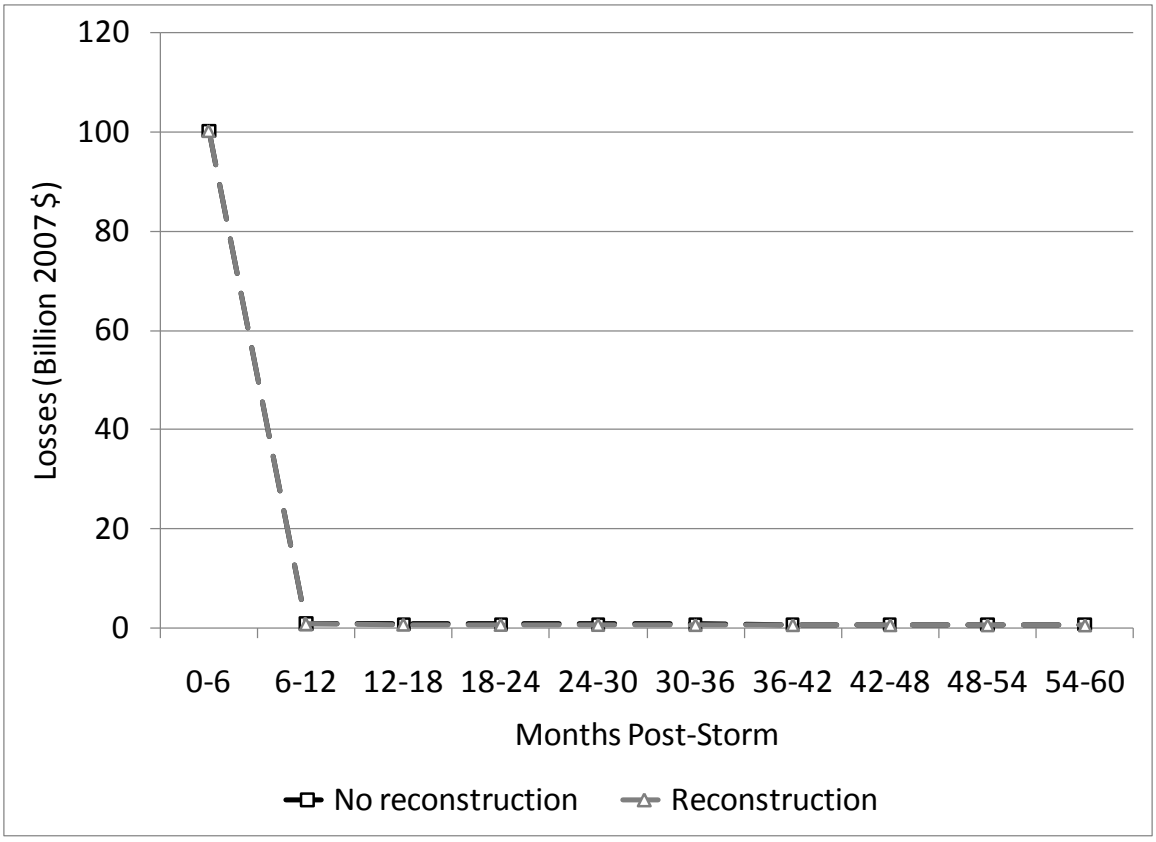
12-18
18-24
24-30
30-36
36-42
42-48
48-54
54-60
Months Post-Storm
No reconstruction
Reconstruction

B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100
80
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40
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Losses (Billion 2007 $)
0-6
6-12
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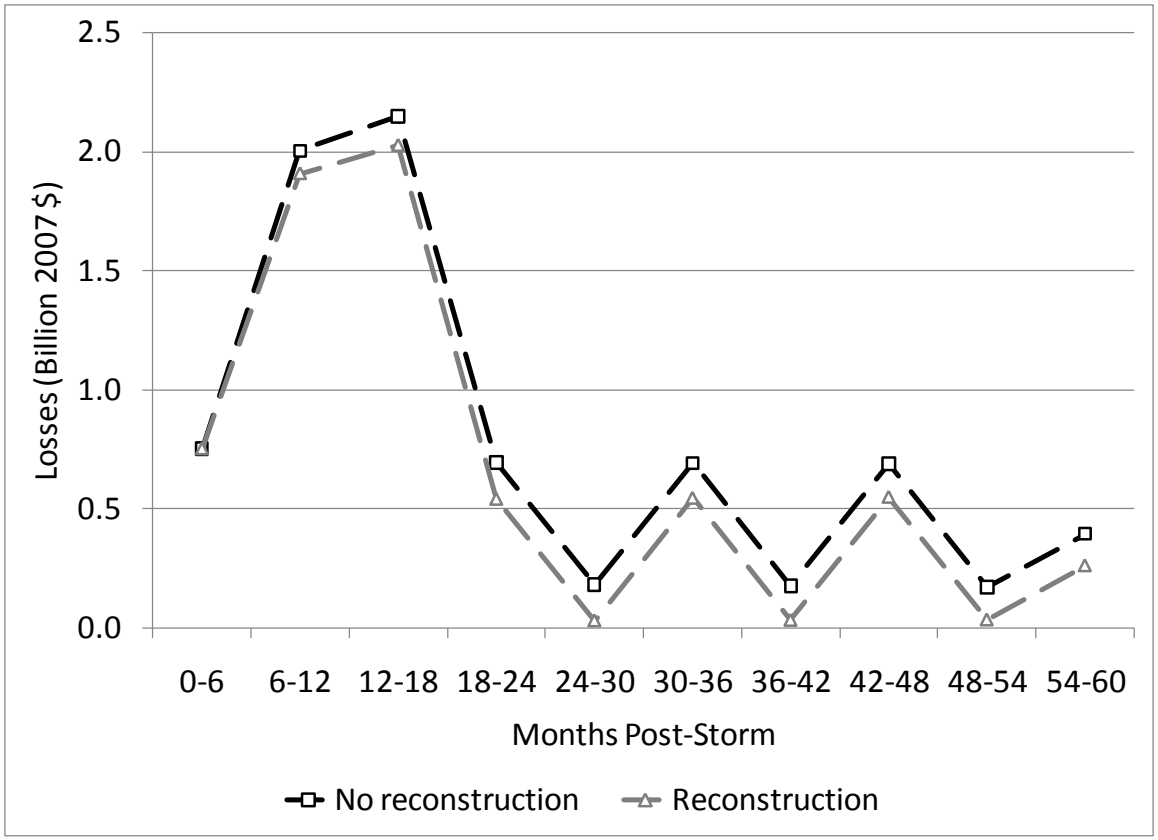
30-36
36-42
42-48
48-54
54-60
Months Post-Storm
No reconstruction
Reconstruction

C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2.0
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Losses (Billion 2007 $)
0-6
6-12
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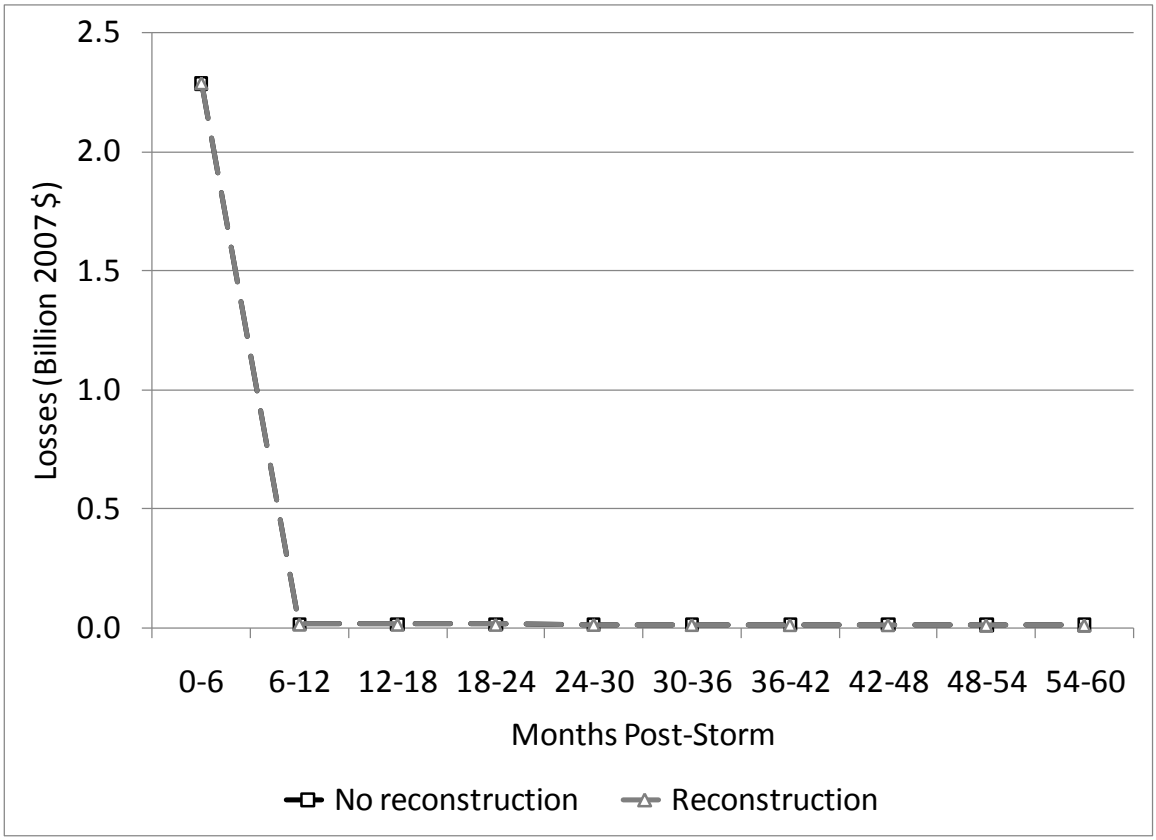
24-30
30-36
36-42
42-48
48-54
54-60
Months Post-Storm
No reconstruction
Reconstruction

D



E

Figure 62. Aggregate value added losses because of various components of storm damage for (A) flood damage. (B) wind damage (C) utility service interruptions (electricity, water, wastewater and telecommunications). (D) crop and livestock damage. (E) evacuation losses.

The temporal pattern of impacts from flooding damages show large and fairly constant value added losses over the first one and one-half years after the storm. The pattern of impacts from the wind and crop loss components of damage shows value added losses in the first 6 months starting out at fairly low levels, then rising sharply toward the second half of the first year and peaking 12-18 months after the disaster before declining, sharply at first as they approach initial levels, and then very gradually falling toward zero. Physical damages and utility disruptions are highest in the initial period, and recovery activity begins immediately. In the case of wind and crop damage, a key reason that the losses peak in the second and third period is that the effect of the recapture factors is especially strong in the first 6-month period but then dissipates quickly thereafter. The recaptured production offsets the heavy losses as a consequence of productivity impacts significantly in the first six months, but this potential reduces in later periods. We assume that recaptured production takes place as soon as possible. For example, a large number of businesses are not severely damaged, but simply cannot operate because one of the utility lifelines is disrupted. Once the utility service comes back on line, the business can resume production immediately, unless there is a shortage of a critical material for which the business does not hold inventory or for which there are no substitutes. If there are

significant lags in recapture, the time-path of BI losses would have an earlier peak and perhaps even be highest in the first period and decline thereafter.

The key initiating factors are the destruction of sector-specific and intersectorally mobile capital stocks in the initial semiannual period, combined with the chilling effect of output losses on economic sector investment, which conspire to reduce the economy's endowment of capital (and therefore productive capacity) in the second semiannual period. Moreover, it is over this later period that the secondary impacts of storm damage on productivity exert the strongest influence, amplifying losses while contributing to further reductions in investment that perpetuate the effects of the shock. In the model, these fluctuations dampen out by 24-30 months post-storm, at which point the growth of the economy resumes. Nevertheless, the combined long-run effect is to move the economy to a lower growth path, so that without reconstruction through exogenous infusions of capital, business-as-usual levels of output and income are not regained.

Reconstruction is modeled as an exogenous replacement of 50 percent of the destroyed capital stock in the first semiannual period, followed by replacement of the remainder at a constant rate over the succeeding two 6-month periods. It is worth noting that although we assume reconstruction is paid for by insurance and outside aid and, therefore, incurs no drain on financial resources on the part of the California economy, the timing does little to mitigate the run-up in losses in the 6-12 months post-storm because most losses are accounted for by the persistent impacts on productivity as opposed to the initial damage to capital stocks. However, reconstruction does have an attenuating effect on peak losses, and its key benefit is to allow the economy to more rapidly converge to its business-as-usual trajectory, thereby dramatically mitigating the present value of losses over the long run. Table 22 indicates that the latter effect reduces the 5-year costs of utility disruptions by 30 percent and of flood damage by more than 35 percent.

Table 22. Present discounted aggregate impact of various components of storm damage on value added.

[%, percent; $, dollar]

A. Flood damage	%	Billion 2007 $	Damage Multiplier
	2 Year Horizon		
Without Reconstruction	-15.7	-508.8	1.10
With Reconstruction	-14.9	-481.7	1.04
	5 Year Horizon		
Without Reconstruction	-7.8	-591.5	1.27
With Reconstruction	-6.6	-497.7	1.07

B. Wind damage	%	Billion 2007 $	Damage Multiplier
	2 Year Horizon		
Without Reconstruction	-0.04	-1.4	1.02
With Reconstruction	-0.04	-1.3	0.94
	5 Year Horizon		
Without Reconstruction	-0.02	-1.7	1.23
With Reconstruction	-0.02	-1.3	0.96

C. Utility service interruptions*	%	Billion 2007 $	Damage Multiplier
	2 Year Horizon		
Without Reconstruction	-3.14	-101.4	1.29
With Reconstruction	-3.14	-101.4	1.29
	5 Year Horizon		
Without Reconstruction	-1.39	-105.1	1.34
With Reconstruction	-1.39	-105.1	1.34

(*electricity, water, wastewater and telecommunications)

D. Crop and livestock damage	%	Billion 2007 $	Damage Multiplier
	2 Year Horizon		
Without Reconstruction	-0.17	-5.3	1.82
With Reconstruction	-0.15	-5.0	1.70
	5 Year Horizon		
Without Reconstruction	-0.10	-7.3	2.02
With Reconstruction	-0.08	-6.2	1.72

E. Evacuation losses	%	Billion 2007 $	Damage Multiplier
	2 Year Horizon		
Without Reconstruction	-0.07	-2.3	0.56
With Reconstruction	-0.07	-2.3	0.56
	5 Year Horizon		
Without Reconstruction	-0.03	-2.4	0.58
With Reconstruction	-0.03	-2.4	0.58

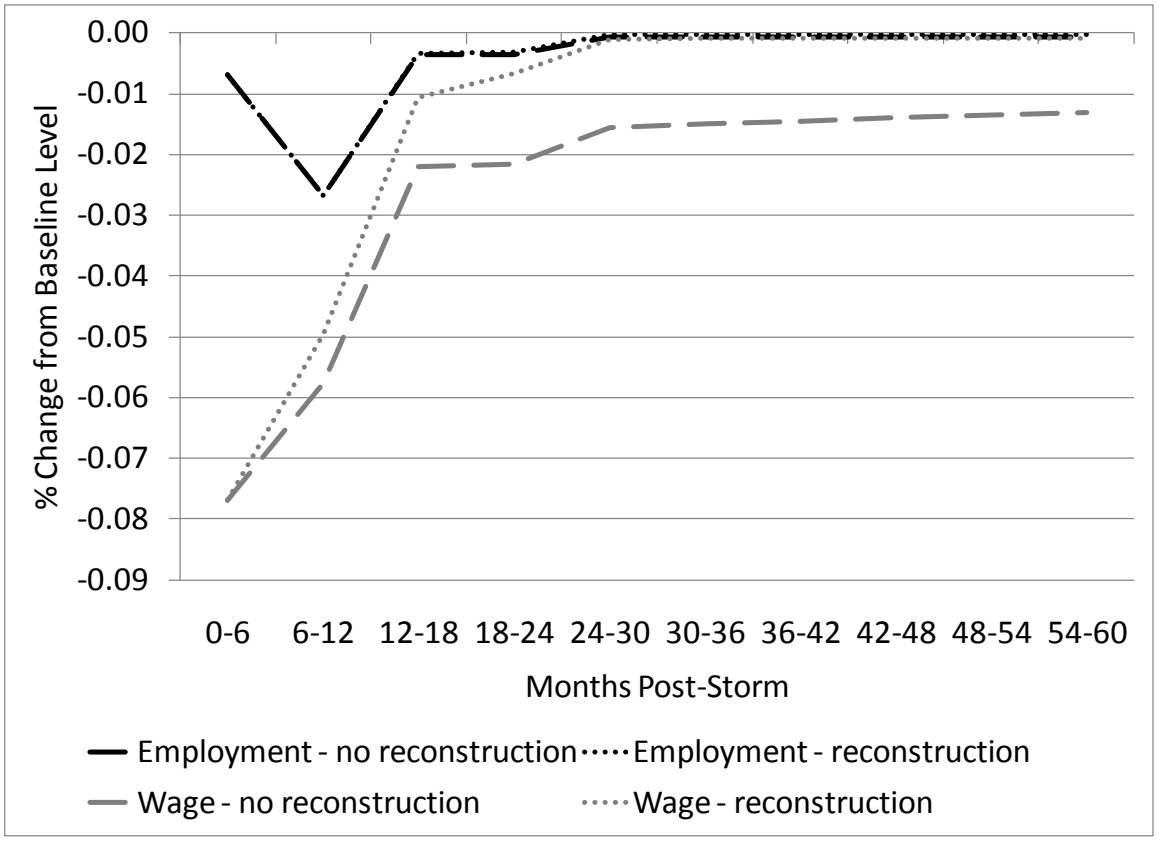
By contrast, the temporal pattern of impacts for utility service and evacuation components of damage is much simpler, concentrated in the first 6 months after the storm and dissipating immediately thereafter. The driving forces that underlie this effect are different. Interruption of electricity, water, wastewater and telecommunications services imposes costs in the form of productivity reductions on the downstream firms that consume these utilities, while any capital stock losses are assumed to be confined to the corresponding upstream sector (for example, damage to cell phone towers, water and sewer mains, electric transmission and distribution assets). Evacuation losses affect industries by rationing the supply of labor, with no capital stock losses at all. The upshot is that at the aggregate level the persistent effect of capital stock losses on the change in overall value added is negligible, and for this same reason reconstruction has no effect on the corresponding economic impacts in this case.

Two features of the results warrant additional explanation. First, the peculiar temporal pattern of losses because of crop and livestock damage is the result of persistent productivity impacts associated with damage to perennial crops that recur on an annual basis, which give rise to a slowly decaying sequence of punctuated losses. This phenomenon arises even in the reconstruction scenario, though the losses there are reduced. Second, the present value of aggregate utilities losses is made up of $54.1 billion reduction in aggregate

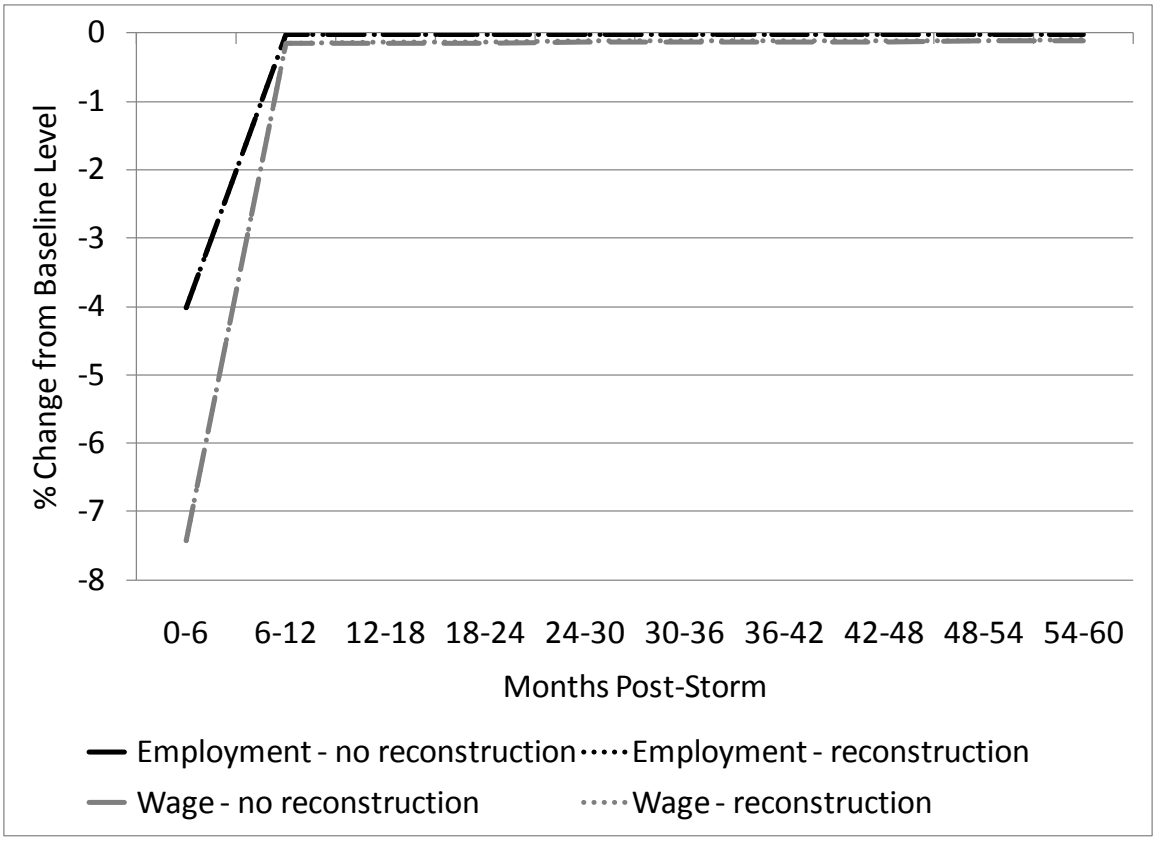
value added because of water outages, and $27.6 billion and $18.1 billion reductions in aggregate value added because of wastewater and electricity outages, with the remainder due to telecommunications outages.

The labor market effects of the components of damage shown in figure 63 have temporal patterns that resemble the losses in aggregate value added, primarily because of the influence of the aforementioned capital stock dynamics on labor's marginal product in the various sectors of the economy. Flooded building damage incurs the most severe impacts, inducing a 14 percent reduction in wages and a 6 percent reduction in aggregate employment relative to the baseline trajectory of the economy. Utility service disruptions are a distant second, with reductions in wages and aggregate employment of 4 percent and 7.5 percent, respectively. The magnitudes of the corresponding impacts for the other components of damage are all less than 1 percent.

A


0.00
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
-0.08
-0.09
% Change from Baseline Level
0-6
6-12
12-18
18-24
24-30
30-36
36-42
42-48
48-54
54-60
Months Post-Storm
Employment - no reconstruction
Employment - reconstruction
Wage - no reconstruction
Wage - reconstruction

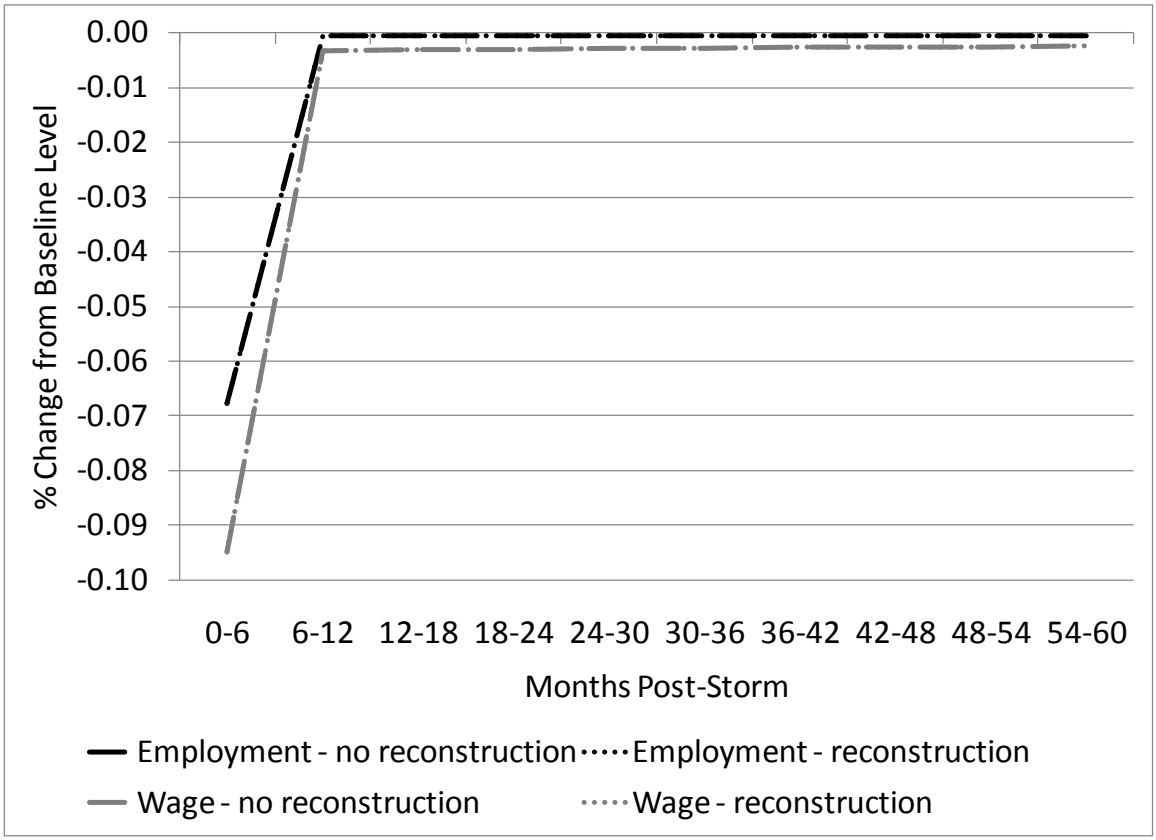
B


0
-1
-2
-3
-4
-5
-6
-7
-8
% Change from Baseline Level
0-6
6-12
12-18
18-24
24-30
30-36
36-42
42-48
48-54
54-60
Months Post-Storm
Employment - no reconstruction
Employment - reconstruction
Wage - no reconstruction
Wage - reconstruction

C

D


0.00
-0.02
-0.04
-0.06
-0.08
-0.10
-0.12
-0.14
-0.16
% Change from Baseline Level
0-6
6-12
12-18
18-24
24-30
30-36
36-42
42-48
48-54
54-60
Months Post-Storm
Employment - no reconstruction
Employment - reconstruction
Wage - no reconstruction
Wage - reconstruction



E

Figure 63. Employment and wage impacts of various components of storm damage for (A) flood damage, (B) wind damage, (C) utility service interruptions (electricity, water, wastewater and telecommunications), (D) crop and livestock damage, (E) evacuation losses.

Table 23 compares the impact of the various components of damage on the discounted present value of aggregate value added. As was seen in Figure 62, the majority of losses are within the first two years after the storm, and the losses are concentrated in flood and utility service components of damage. The multiplier statistic is the ratio of ex-post value added losses computed by the CGE model to the ex-ante reduction in sectoral gross output that constitutes the direct business interruption impact. With the exception of losses due to evacuation, the multiplier computed on a 5-year horizon is above unity, indicating that the impacts of the shock on the economy's productive capacity and general equilibrium inter-market price and quantity adjustments are between 27 percent and 129 percent larger than the direct productivity effects on the value of output. (The size of the latter figure, which pertains to crop and livestock damage, indicates the importance of indirect price-mediated substitution effects in downstream industries that use the outputs of agricultural sectors relatively intensively.) This multiplier also highlights the crucial role played by reconstruction in mitigating the economic costs of physical damage, which in the case of flood and wind damage reduces the magnitude of ex-post losses below that of the ex-ante shock. However, this is not the case with components such as utility service disruptions, evacuation losses, and agricultural damage, where destruction of the capital stock plays a minor role and the bulk of the aggregate shock manifests through reductions in industries' productivity.

For many of the components of storm damage, the effects on individual sectors were small enough that it was difficult to discern with precision how the characteristics of the industries determined changes in value added that were observed in the results. Table 23 identifies the big winners and losers in this regard, focusing on flood damage component, where the impact is large enough to be most transparent. Here we see that reconstruction activity not only has a substantial mitigating effect on the losses incurred by those sectors that are hardest hit, it also attenuates the gains enjoyed by sectors that would otherwise expand by re-absorbing displaced labor and intersectorally mobile capital. Though more analysis is necessary to pin down why the sectors that gain (or lose) the most, do so, a key attribute appears to be the fraction of the industry's capital stock that is specific to that sector. In particular, industries with a larger share of intersectorally mobile capital see reallocation of assets to other parts of the economy where those assets can earn a higher rate of return. But while such intersectoral "capital churning" adversely affects these industries in which capital is more mobile, it lowers the costs of adjustment to the storm for the economy as a whole.

Table 23. Present discounted sectoral impacts of flood losses.

Computed on a 5-year time horizon by using a 5 percent discount rate. [%, percent; $, dollar]

Without Reconstruction	Change		With Reconstruction	Change	
	%	Billion 2007 $		%	Billion 2007 $
Sectors experiencing largest % gain in value added relative to baseline scenario					
Nonmetal mineral prod	36.9	8.7	Nonmetal mineral prod	23.4	5.5
Natural gas distribution	35.3	20.1	Natural gas distribution	21.0	12.0
Internet publishing and broadcasting	25.1	13.7	Internet publishing and broadcasting	16.6	9.1
Paper Manufacturing	16.5	1.7	Warehousing & storage	14.6	2.8
Other information services	16.1	8.1	Paper Manufacturing	13.3	1.4
Sectors experiencing largest % loss in value added relative to baseline scenario					
Residential Construction	-24.2	-38.6	Residential Construction	-21.0	-33.5
Non-store retailers	-21.7	-7.4	Owner-occupied Dwellings	-20.8	-67.6
Nonresidential Construction	-21.1	-57.5	Nonresidential Construction	-17.6	-47.9
Owner-occupied Dwellings	-20.6	-66.8	Non-store retailers	-16.4	-5.6
Gasoline stations	-18.5	-4.2	Bldg materials & garden dealers	-14.1	-4.6

SUMMARY OF RESULTS

The major economic results of our study are presented in table 24. The first part of the table summarizes property damage calculated earlier in the report, while the second collates the business interruption losses.

Table 24. Summary of ARkStorm costs and business interruption. With recapture and without reconstruction[a)] for California over a 5-year time horizon.

[in billions of 2007 U.S. dollars]

	Property repair/ reconstruction cost	Business Interruption
Building Flood Damage	$195.0[b]	$591.5
Related Content Damage	103.0	
Building Wind Damage	5.6	1.7
Agricultural Damage[c]	3.6[d]	7.3
Power System Damage	1.0[e]	18.1
Telecommunication System Damage	0.1	5.2
Wastewater System Damage[f]	0.3	27.6
Water System Damage[g]	3.0[h]	54.1
Highway/road Damage[i]	2.5[j]	0.02[k]
Levee Repair and Island Dewatering[l]	0.5	n.a.[m]
Evacuation		2.4
Relocation	39.0[n]	n.a.[o]
Total	353.6	707.9
Total After Double-Counting Adjustment	353.3	627.4

[a] Results for the case "without reconstruction" are used in this summary because they report the gross damage from the event; the "with reconstruction" case includes an offsetting stimulus and gives a misleading picture of losses from the hazard when most of the funding comes from outside of the region.

[b] Weather and flood warning (of at least 48 hours) could reduce building damages by $30 billion, while demand surge could increase property repair costs by $70 billion. (See section on Building Content and Repair Costs).

[c] Agricultural costs pertain to field damage, crop, and livestock replacement, and forgone income from crop losses.

[d] Agricultural losses increase to $6.8 billion for high end range of flood duration estimate.

[e] Power system repair cost estimates range from $0.3-$3 billion.

[f] Wastewater system repair costs pertain to sewer pipe damage.

[g] Water system repair costs pertain to electric equipment and well damage.

[h] Water system repair cost estimate ranges from $1-10 billion.

[i] Highway/road repair cost pertain to landslide damages.

[j] Highway repair cost estimate ranges from $2-3 billion.

[k] Economic impacts from reduced highway capacity pertain to truck traffic in California only.

[l] Levee repair and dewatering costs pertain to the levees and islands in the Delta area only.

[m] Potentially, levee repair and island dewatering time would increase business interruption losses through increased agricultural damages.

[n] $39 billion relocation costs calculated by using HAZUS-MH formulas, $25 billion for relocation of residences and $11 billion for relocation of commercial establishments, and the remainder for industry, education, religion, and agricultural occupancy classes.

[o] The positive effects of relocation have not been evaluated; building service interruption time multipliers have not been developed for the flood module of HAZUS-MH

The ARkStorm scenario presents a flood catastrophe and wind disaster. Hundreds of billions of dollars of building damages can cause even greater hundreds of billions of dollars of business interruption losses because of building downtimes of one to three years. These downtimes were lengthened by the inclusion of add-ons such as drying out the buildings, permitting and dealing with hazardous waste. In contrast, the shorter building downtimes from wind damages result in business interruption losses that are less than the wind damage property repair and replacement costs.

The business interruption losses from lifeline outages depend on the spatial scale of the outages, the time to restore service, the importance of the lifeline service to operations, and the availability of substitutes. Water and power lifelines cause the greatest business interruptions: the water supply system is presumed to have longer restoration times than the other lifelines and power system outages, affecting all counties, are more widespread than the other lifelines. However, consideration of double counting reduces the business interruption loss contribution from water such that power causes more business interruptions than water after adjusting for double counting. This loss is because of more spatial correlation of flooded building damages with water outages than power outages. The ratio of business interruption losses to replacement cost is highest among the lifelines reinforcing the importance of critical infrastructure to the macro economy.

Agricultural business interruption losses are only slightly larger than soil and crop damage. The impact of evacuation is quite small because we only isolated the flood duration component of evacuation time. We considered the impact of highway damages on truck traffic only, in terms of increased shipping costs because of increased travel time, though these costs are moderated by the redundancy in the highway network

The $327 billion in business interruption from ARkStorm would make this the costliest disaster in the history of the U.S. For example, business interruption from the ShakeOut Earthquake Scenario is estimated to be about $67 billion, from the World Trade Center attack a maximum of $100 billion, and from Hurricane Katrina currently (2010) $100 billion (though still rising because recovery has not been completed). The magnitude is a combination of the intensity of the storm, the vulnerability of the site in terms of a large asset base that is ill protected from this kind of event, and its large areal extent.

CONCLUSION

We have estimated the economic impacts of ARkStorm to be several hundred billion dollars over a five-year period. At the same time, we offer many caveats to the economic analysis. There are limitations in scope (for example, levee repair estimates for the Delta region only, impacts of transportation for highways/roads and truck traffic only), gaps in knowledge (for example, lack of building service interruption time multipliers for flood damaged buildings), and uncertainties in the cost estimates (noted as ranges for lifelines and agricultural damages, and as adjustments for warnings and demand surge in the notes for (table 24)) are two. However, the relative order of magnitude of the results is likely representative of the domination of flooded building damages and economic impacts followed by lifeline services, water service in particular. Although agricultural and transportation damages and impacts are estimated as relatively light, they are on a much greater scale than experienced during previous California storms. Similarly, the scale of evacuation would be unprecedented for California. Sensitivity analysis will be used in the next stage of the research to explore the effects of the uncertainties in the damage and restoration estimates.

The novel aspect of this study is the use of a computable general equilibrium approach to systematically characterize and quantify the economic consequences of the full spectrum of

individual but overlapping impacts of a large-scale natural disaster. Cost estimation based on the full spectrum of individual impact categories is not new in large-scale disaster research, as, for example the ShakeOut earthquake scenario study (Jones and others, 2008; Rose and others, written commun.). However, the input-output approaches utilized by ShakeOut and similar studies (Okuyama and Chang, 2004; Okuyama, 2007) have difficulty capturing the feedback effects of property damage, temporary interruptions in labor supplies, and hysteretic adverse productivity shocks on prices, producers' and consumers' substitution responses, and concomitant intersectoral supply-demand adjustments across the economy. Distinctly, prior CGE analyses of the effects of disasters either limit consideration of impacts to a fairly narrow range of damage categories (Rose and Liao, 2005; Rose and others, 2007), or express the shock to the economy in a highly aggregate fashion with little differentiation among different types of damage (Selcuk and Yeldan, 2001), potentially leading to under- or double-counting of impacts (respectively) and the associated macroeconomic costs. Bearing these issues in mind, our key contribution is the development of algorithms for translating the outputs of geospatial engineering models of disaster damage (HAZUS-MH) into sequences of shocks to capital stocks and productivity in various industry sectors, and to aggregate together the resulting general equilibrium economic cost impacts in a way that controls for the overlapping effects of different categories of damage. (A useful point of comparison is Rose and others (2009) alternative approach of specifying BI losses directly as constraints on the outputs of CGE model sectors.) By addressing several of the methodological concerns outlined in Rose (2004a) and Okuyama (2007), the current advance provides a roadmap for refining future estimates of both the macroeconomic costs of disasters and the mitigating influence of resilience.

Truck Traffic Economic Impacts from Reduced Highway Capacities

Closed highways and reduced highway capacities because of landslide and flooding damages will affect emergency responder access and commuter and truck routes. Analytical methods to analyze effects of extreme weather on the performance of the transportation system is not well developed. For the ARkStorm scenario, we attempted an economic impact analysis of large truck traffic. We obtained technical support from various University of Southern California-affiliated independent consultants through Hanh Dam Le Griffin (TTW, Inc.). Their transportation model analyzed the effects of reduced highway capacities on the regional and national movement of goods and services by estimating changes in truck distance, travel time, and associated costs and the impacts of increased shipping prices on major economic sectors. Despite the sophistication of this modeling system, we identified various issues with its application to a winter storm event and determined some of the research needs for transportation modeling.

Method of Analysis

The state and national highway network was analyzed for 4 points in time following the southern California storm: on day 3, day 14 (one day after the northern California storm), day 90, and day 180. The highway capacities on these days are explained and mapped in the highway damage section of this report. Independent model runs were conducted for the southern and northern storm events —generating a total of seven model runs for the analysis. (Note that highway damages from the northern California storm have not yet occurred on day 3.)

A model run on the national highway network is comprised of three principal models: a national highway network model, a transportation cost model, and a demand-driven national interstate economic model (the National Interstate Economic Model (NIEMO) and an elaborated TransNIEMO) that have been developed by the consultant group (Park and others, 2005, 2007,

2009). These models analyze the movement of truck traffic on the national highway network and the economic impact of any change in truck travel distance and/or time resulting from reduced highway capacities on the national highway network. The analysis assumed that the trucking industry is able to pass costs (of increased time and distance) to customers in the form of prices. The final users, mainly households and government, react to higher priced products and services by cutting back on consumption. Reduced demand for industry outputs prompts a new interindustry trade and production equilibrium. This framework (fig. 64) was used to estimate the truck transportation related economic impacts of the ARkStorm scenario throughout the nation.

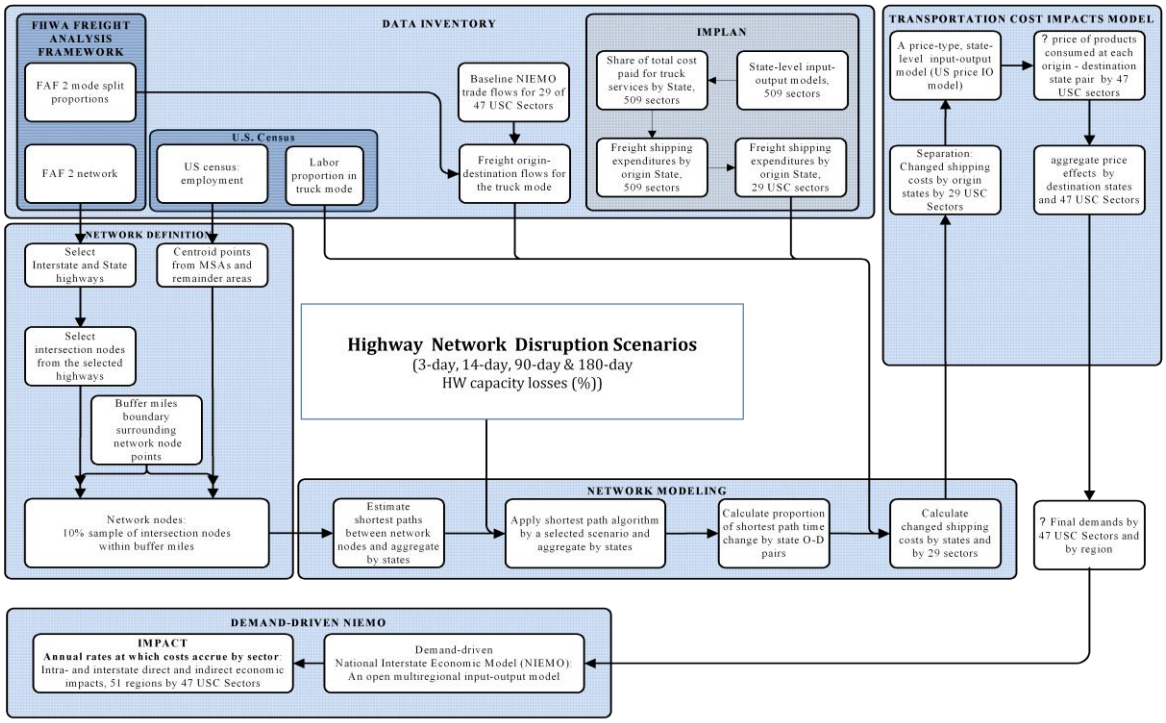


Figure 64. TransNIEMO economic impact modeling framework.

The 2002 Federal Highway Administration (FHWA) Freight Analysis Framework (FAF) dataset was used to construct highway network links on the national highway network. Percent capacity losses on the links were set accordingly for days 3, 14, 90, and 180. The FHWA FAF dataset provided large truck trips that have been converted from commodity flows (U.S. Department of Transportation, 2007). The truck traffic was assigned to the national highway network by using a standard link capacity constrained user equilibrium model and shortest-path travel time algorithm; truck traffic is forced to re-route in response to losses in highway capacity and road closures.[29] The model selected best alternate routes for the concurrent users. The re-routing of truck traffic resulted in changes in time and distance traveled by trucks. Results were aggregated by state of

[29] The re-routing assumption neglects to consider resilience strategies of changing transportation modes or changing trucking schedules.

origin and destination and reported for California, other states combined, and all of the national highway network.

Next, the effects of changes in total truck travel time and distance on trucking costs were assessed for (49) states across 29 commodity sectors[30] by using the transportation cost impact model based on a cost-price input-output model. The difference in trucking time and distance was converted to dollars by summing the variable costs of time ($17per hour labor rate) and distance (for example, $0.48/mile) (Berwick and Farooq, 2003)[31]. The increased shipping costs from the state of origin (i) to the state of destination (j) for industry sector (k, k=1…29) were aggregated by the state of destination. Total truck costs (measured in millions of dollars per year were summarized for California, other states combined, and a total for the U.S. Finally, based on changes in total shipping costs for the 29 University of Southern California commodity sectors, a destination-state cost-price input-output model measured the effect of price increases on 47 economic sectors in 49 destination states. The model assumed that 100 percent of increased shipping costs were passed on to customers as increased prices for goods and services at the destinations, which results in decreased consumer demand for goods and services. The NIEMO estimated direct and indirect economic damages associated with changes in consumer demand at the destination states. The economic impacts (measured in millions of dollars of industry output) were aggregated by destination state for each scenario and summarized for California, other states combined, and the U.S.

Truck travel time, distance, cost, and economic impacts

Change in truck travel time and distance: table 25 and table 26 present differences in truck travel time and distance, relative to the 2002 baseline, for each model run received from TTW, Inc. Overall, increases in truck travel time results from the re-routing that occurs in response to ARkStorm highway capacity reductions and closures. Most of the California truck travel time increases occur from the southern California storm reflecting the severe capacity losses of the highway network in southern California on day 3 and also the region's significant trade volume and goods movement activities. On Day 14, the increase in truck travel time in the south is reduced following restored highway capacities on some routes affected by flooding and erosion and landslides. Truck travel is less affected by the northern storm, but as noted under the study limitations, route 99 was allowed to operate at full capacity when it should have been closed. Re-routing increases travel time throughout the rest of the country, but the use of alternative routes

[30] The models utilize common-denominator aggregations of standard economic classifications (including NAICS, SIC, and others), called the University of Southern California Sectors. There are 47 University of Southern California Sectors, 29 of which are commodity sectors. The commodities are shipped, but the availability can affect the remaining sectors. Therefore, first-order network effects are reported for 29 sectors, but full effects are reported for all 47 sectors.

[31] The equation to calculate truckers' labor cost per mile in appendix A of Berwick and Farooq (2003) assumes that the Labor (Wage) Rate per Hour (LRPH) is $10 per hour. For this analysis the current (2010) LRPH is updated to $17 per hour yielding a trucker's labor cost of $0.09 per mile. Other variable costs are $0.48 per mile such that the estimated labor cost is 65 percent of the total variable cost (0.65 = 0.9 / (0.9+0.48)).

actually decreases the total truck travel distance in the other states. Some routes experience less congestion and a corresponding gain in traffic flow.

Table 25. Change in highway network truck travel time.
2002 FHWA Freight Analysis Framework (FAF) data as baseline.
Aggregated to spatial unit by network origin and destination.

Region	Truck Travel Time Increase (in Hours)			
	Day 3	Day 14	Day 90	Day 180
Southern California storm	231.0	17.0	0.3	zero
Northern California storm	n/a	37.8	1.3	1.1
TOTAL California	231.0	54.8	1.5	1.1
OTHER STATES	899.3	410.5	44.3	4.5
TOTAL U.S.	1,130.3	465.4	45.8	5.6

Table 26. Change in highway network truck travel distance.
2002 FHWA Freight Analysis Framework (FAF) data as baseline.
Negative signs denote a decrease in truck miles.
Aggregated to spatial unit by network origin and destination.

Region	Truck Travel Distance Increase (in Miles)			
	Day 3	Day 14	Day 90	Day 180
Southern California storm	8027	1,968	75	zero
Northern California storm	n/a	1,063	97	194
TOTAL California	8,027	3,031	173	194
OTHER STATES	-63,312	-3,105	-2,215	-878
TOTAL U.S.	-55,285	-74	-2,043	-684

Figure 65 and figure 66 display the change of network volumes on day 3 from the southern California storm, and day 14 from the northern California storm, respectively. On Day 3, the southern California network link volumes experience substantial percentage changes, especially on the Ventura Freeway (U.S. 101 and route 134) east-west route through Ventura County and in the southern San Fernando Valley in Los Angeles County. However, the effects are not limited to southern California, as indicated by the percentage volume changes in the rest of country, albeit of a much smaller scale. On day 14, in northern and central California, there is a high percentage decrease in network link volumes in Sacramento, the Bay Area, and the Central Valley. Similar to the results of the southern California storm event, the impacts are not limited to just the northern and central regions of the state, but at a smaller scale to southern California and other states. For traffic volumes traveling between a specific pair of origin and destination points in the national network, ARkStorm highway capacity changes will result in some volume decreases along certain links, and countervailing increases in volume along alternative links.

Rough extrapolation of the 4 day results to the 6 month period following ARkStorm suggests that the total number of truck miles reduces by about 600,000 miles because of re-routing: the truck miles increase by 100,000 miles in California and decrease by 700,000 miles throughout the rest of the U.S. However, total truck travel time increases by 18,000 hours: truck travel time increase by 15,000 hours outside of California and most of the 3,000 hour truck travel time increase in California is associated with the southern California storm. These results suggest that while both truck travel distances and time would increase within California, trucking costs outside of California could involve a trade-off between fewer miles travelled and longer travelling times.

Figure 65. National highway network volume change for southern California storm on day 3.

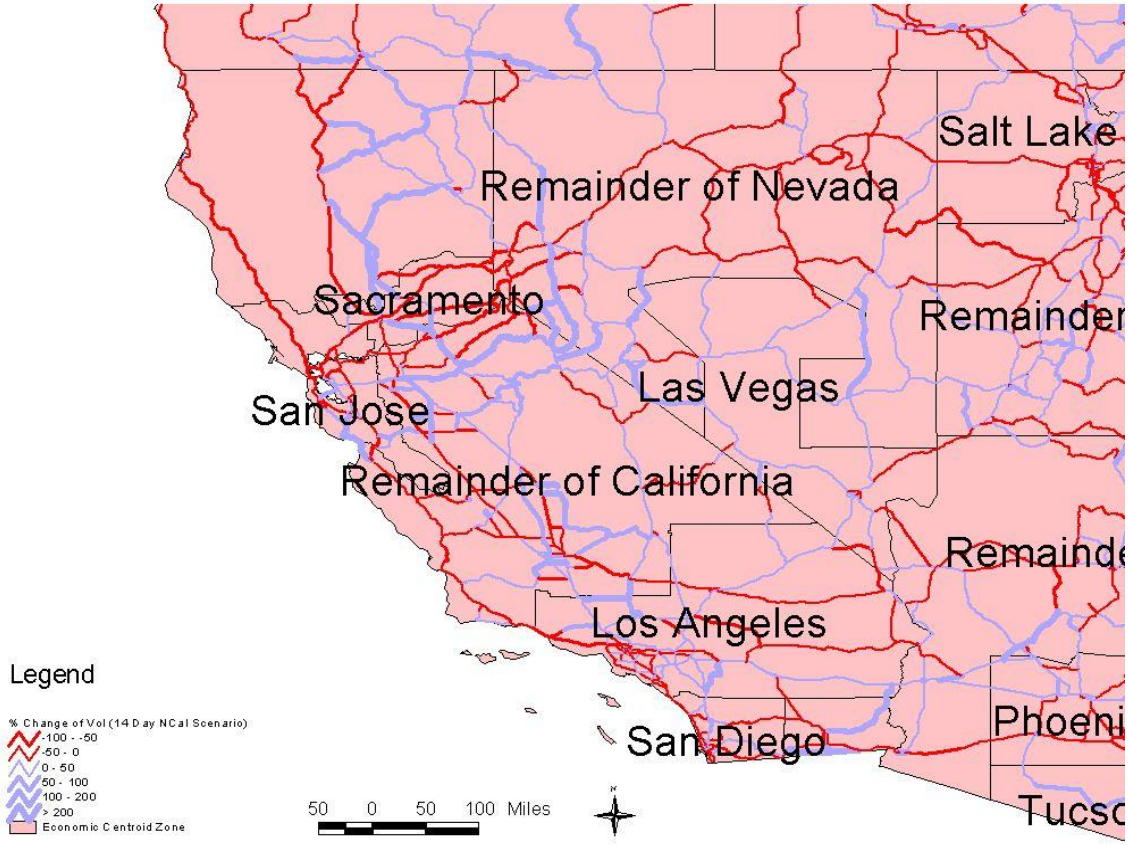


Figure 66. National highway network volume change for northern California storm on day 14.

Truck traffic time and distance costs: outside of California, there are overall gains in trucking costs after an initial decrease in trucking costs (of -0.05 million dollars) on Day 3 (table 27). This result reflects the dynamics of improved traffic flow on some routes in other states. Aggregate trucking costs for California destinations increase, relative to the baseline, but taper off as highway capacity is restored. The costs of commodity shipments, induced by ARkStorm highway capacity losses, would be felt throughout the U.S. These impacts vary substantially across the 29 commodity sectors and 49 states as trade value and activity between California and other states vary, with some commodities experiencing increased trucking cost while others benefit from reduced shipping costs.

Table 27. Change in trucking costs.
Costs are aggregated to spatial unit by geographic destination.

Time is valued at $17 per hour; distance is valued at $0.48 per mile.

Impact on truck costs associated with 29 commodity sectors (excluding service sectors).

Negative sign denotes a decrease in truck costs for commodity shipments.

[n/a, not applicable]

Region	Total Trucking Costs (in millions of dollars)			
	Day 3	Day 14	Day 90	Day 180
Southern California	2.2	0.7	0.0	0.00
Northern California	n/a	0.6	0.1	0.03
TOTAL California	2.2	1.2	0.1	0.03
OTHER STATES	0.0	0.8	0.3	0.01
TOTAL US	2.2	2.0	0.4	0.04

Rough extrapolation of the 4 days to 6 months suggests that trucking costs increase on the order of $60 million dollars: $38 million in California with 75 percent of the cost increases associated with the highway damages from the southern California storm and $22 million trucking cost increases in other states.

Truck traffic economic impact: The total (direct and indirect) economic impact, measured in terms of industry output losses (in millions of dollars), is associated with trucking cost changes only.[32] Table 28 presents estimates of the economic impacts of reduced highway capacities from the ARkStorm scenario for each of the 4 days. Table 28 is not a simple and direct reflection of changes in trucking costs (table 27) because of consumer responses to changes in prices.

[32] Other economic impacts that may occur as a consequence of highway network disruption associated with California storm events were not accommodated.

Table 28. Truck traffic economic impact.
Aggregated by geographic destination.
Time value at $17 per hour; distance value at $0.48 per mile.
Negative signs denote a gain in economic output.
[n/a, not applicable]

	Total impact (in millions of dollars of output)			
	Day 3	Day 14	Day 90	Day 180
Southern California	1.1	0.3	-0.03	0.00
Northern California	n/a	0.3	0.03	-0.04
TOTAL California	1.1	0.6	0.00	-0.04
OTHER STATES	0.2	0.8	0.34	0.09
TOTAL US	1.3	1.4	0.34	0.06

The economic impact of the ARkStorm highway capacity reductions is evident throughout the nation. The national aggregation of results suggests that there are output losses, although there are slight output gains in California (estimated at $30,000 for Day 90 in southern California and $40,000 for Day 180 in northern California) as highway conditions improve. Other states also experienced output gains (where substitution of pricier commodities favored some sectors in some states) that were offset by output losses in other states. Therefore, given the fixed interindustrial and trade relationships (of the NIEMO model) economic impact in some states can positively affect the economy in California through the industrial links and domestic trade activities of these states with California. For California, the largest gains in economic output were reported for the motorized and other vehicles sector. The sectors with the largest output losses included construction, other services, wood products, electronics, real estate, and accommodation and food services.

Rough extrapolation of the 4 day analyses suggest that output losses for California are on the order of $16 million and are mostly attributed to the southern California storm. Output losses of $27 million in the rest of the U.S. adds up to a $43 million economic impact to the U.S. economy from ARkStorm highway network disruptions. These economic impacts are an order of magnitude less than the $500 million estimates of delayed and lost automobile and truck trip costs calculated for the ShakeOut earthquake scenario in the southern California region (Jones and others, 2008). Conversely, the costs of ARkStorm highway repairs of $2.5 billion are an order of magnitude greater than the repair cost estimate of $400 million for the ShakeOut scenario. We conclude that while the highway truck transportation model accommodates the scale of California and the rest of the country, various compromises very likely have underestimated the economic impacts of the ARkStorm highway capacity reductions.

RESEARCH NEEDS RELATED TO TRAFFIC ECONOMIC IMPACTS

Overall, despite the accomplishment of applying a state-of-the-art highway model to analyze the ARkStorm highway capacity reductions, budget and time constraints did not permit further investigation of the limitations and research gaps that were identified. First, the analysis was

challenged by the hundreds of highway capacity alterations from ARkStorm landslides and flooding. These analyses were aggregated to reduce the burden on data entry. During this process, it appears that flood related capacity reductions along California 99 between the Grapevine and Sacramento were overlooked; Day 14 conditions would not likely allow the re-routing and volume increases along this highway. Highway closures and capacity reductions along California 99 would increase truck travel time, distance, and costs, and economic impacts. Second, independent model runs of the northern and southern storms have missed interactive effects of the damages from the two storms on truck travel and will have further underestimated the impacts of truck distance, time, associated costs and price feedbacks. Third, the analysis of four days captured the impacts as snapshots in time so that it was necessary to coarsely extrapolate to the six-month period following the winter storm scenario. Fourth, we took stock of highway damages and capacities at the conclusion of each of the southern and northern storms. Therefore, we have not captured all the phases of a severe storm. Precipitation, wind, and wave surge in coastal areas that precede inundation or actual closure of roadways would also effect highway operations and safety in the form of travel delays. Fifth, the model, as complex as it is, only implements the resilience strategy of re-routing. Other strategies such as change of travel time (for example, travelling through the night) or change of transportation modes (to rail or air) were not considered. Beyond a price response, industrial sector resilience strategies for supply chain disruptions were not incorporated. Sixth, the result of reduced truck distances and increase miles needs further exploration and explanation. Although equilibrium-based network models are appropriate for uncongested urban network when travel time is a function of volume, and traffic demand is spread over many alternative routes in such a way to equalize volume-sensitive travel times on each of the routes, the application to the interstate network requires caution. Furthermore, equilibrium–based network models have been used to analyze investment scenarios that add capacity or enhance performance, rather than degrade it in the case of disasters. Reduced highway capacity can create impossible optimization problems if a subnetwork is totally isolated from the network. (Sungbin Cho, Southern California Association of Governments, written commun., 2010) Seventh, explanation of the effects on the different sectors would be insightful. Eighth, the models used to analyze economic impacts were developed to deal solely with truck traffic and movement on the national highway network. Therefore, for this and various other reasons, stated above, the results for the ARkStorm scenario (table 24) understate the potential economic impacts of reduced highway capacities from such storms.

The ARkStorm scenario would affect the mobility of automobile and emergency vehicles, and further studies and additional data would be required to assess these impacts in any detail. In principle, the impacts on automobile and emergency vehicles would reflect those estimated for truck traffic. Because of highway capacity losses and road closures, automobiles and emergency vehicles also would be forced to re-route to avoid congestion or to reach their destinations. As result of re-routing, travel delays would likely occur and be measurable on a value of time and distance basis. In addition to re-routing, depending on trip type and purpose, some commuters and travelers might switch to alternative modes, such as public transit; some may be able to telecommute; and some travelers may decide not to travel. These decisions could alter the number and timing of automobile trips on the national highway, and consequently traffic flows in some parts of the network may experience relief. The response of auto travelers to highway capacity losses and road closures are somewhat similar to those of trucks, although automobile and small truck trips have more flexibility than large truck trips that tend to be more time sensitive and have fewer routing and alternative modes of transportation. In addition, emergency vehicles and also some trucking companies may have designated alternative routes and may not react to time, cost, and congestion alone. The consequences of delay or an inability to travel or effectively respond to

emergency situations, could potentially be substantial. Any quantitative measure and confirmation of these impacts would require further in-depth study.

Finally, for future analysis of storm events in the broader context of climate change, further development of transportation models for conditions of reduced highway capacities and closures are needed to inform planning decisions about industrial locations and emergency plans. Linkages to environmental impacts of extreme weather in terms of fuel use and greenhouse gas emissions could also be made. (Reza Navai, California Department of Transportation, written commun., 2010)

Environmental and Health Issues

This section is an abridged version of a much more detailed report (G. Plumlee and C. Alpers, USGS, written commun., 2010). The rainfall, snowfall, erosion, flooding, landslides, winds, and resulting physical damage to infrastructure from an extreme storm such as that modeled by ARkStorm could result in substantial physical and chemical stresses on the environment, with resulting impacts on the health of affected ecosystems and humans. The framework developed for the ARkStorm meteorology and physical impacts can be integrated with a wide variety of information to infer plausible scenarios for environmental, ecological, and environmental-health impacts of the hypothesized storm.

PLAUSIBLE ENVIRONMENTAL-HEALTH ISSUES AND IMPACTS

Severe storms can pose diverse and significant physical threats to human safety. Common results of these threats include, for example, drowning in flood waters and injuries or death caused by hypothermia, tornadoes, floodwater-borne debris, lightning strikes, rainfall-triggered landslides or rockfalls, avalanches, and wind-related damages (such as falling trees or power lines), and fires from petroleum products released into floodwaters. These hazards deservedly receive the bulk of public-health focus during active storms, and a detailed analysis of plausible ARkStorm impacts in this realm should prove extremely useful, but is beyond the scope of this study. The focus of our analysis from a public-health perspective is on plausible environmental-health impacts, meaning those shorter- to longer-term health issues that result from environmental exposures.

Our analysis is based in part on inferences that can be drawn from peer-reviewed publications summarizing environmental and environmental-health impacts documented or postulated from past storms and floods, both in California and elsewhere. Based on this type of analysis, a wide variety of plausible environmental issues must be considered for ARkStorm.

Storm runoff, particularly in those areas receiving high hourly rainfall rates and areas in which rain falls on pre-existing snow, would likely lead to widespread erosion, transport, and redistribution of soils, sediments, and rock materials. The physical impacts alone of these materials on riverine, floodplain, lacustrine, and coastal environments could be substantial and could lead to significant impacts on species habitat and loss of life in some aquatic or terrestrial organism populations.

Some rock types, and the soils developed on them, may contain naturally elevated levels of potentially toxic metals (such as selenium, zinc, copper, arsenic, and lead), environmentally deleterious minerals (such as iron sulfides that generate acid rock drainage when weathered), mineral toxicants (such as asbestos), or pathogens (such as Coccidioides Immitis, the soil fungus that causes Valley Fever). Storm-induced erosion or landslides affecting these rock types have the potential to disperse these materials in the environment.

Storm or flood damage to buildings, infrastructure, industrial facilities, or agricultural facilities (such as wastewater treatment plants, petroleum refineries, active or inactive mines, chemical manufacturing plants, animal feeding operations, and others) could release debris, contaminants, and microbial pathogens into the environment. Erosion or flooding of agricultural lands could lead to extensive loss or contamination of arable soils. Storm runoff from agricultural lands, residential areas, and urban areas could release a variety of sediment-borne or water-borne anthropogenic contaminants into the environment. Water supplies used for human consumption, livestock consumption, or agricultural irrigation, including surface water and shallow groundwater, could become contaminated by a wide variety of contaminants or pathogens. Following the storm, contaminated sediments and debris redistributed by landslides or floodwaters could then dry out and become available for further redistribution by human disturbance and (or) wind transport.

In addition to the acute physical threats to safety posed by the storm, the possibility exists for adverse health effects on humans and ecosystems. These effects could include, for example, potential outbreaks of infectious disease from exposure to contaminated floodwaters, consumption of contaminated drinking water, or exposure to dusts from landslide or flood deposits containing soil pathogens such as Coccidioides Immitis. In most developed countries, effective health hazard communication and preventive emergency response measures (such as warnings not to drink potentially contaminated water and providing access to uncontaminated water) commonly prevent or substantially lessen the magnitude of many infectious disease outbreaks. However, as shown in this report, widespread flooding and damage to infrastructure could reduce the ability of emergency responders to provide basic services in the timeframe needed to avoid at least some infectious disease occurrences; an example would be the challenges of providing fresh drinking water to large numbers of people across broad storm-affected areas.

APPROACH FOR ENVIRONMENTAL AND HEALTH IMPACTS

While the list of plausible environmental and environmental-health issues that could result from ARkStorm is substantial, a much more detailed analysis of each issue is needed to determine the likelihood of whether it would actually occur and, if likely, the magnitude of the potential impacts. While detailed analyses of all potential issues are well beyond the scope of this study, we have outlined and begun to test an approach by which such analyses can be made.

Further insights about potential geogenic (natural) and anthropogenic sources of storm-induced environmental contamination can be gleaned by linking ARkStorm precipitation and flooding maps to data extracted from diverse database sources with geologic, hazards, and environmental information. Guided by results of such analyses, site-specific or other types of investigations can be developed to assess in more detail the potential occurrences and magnitude of the issues in question. Two examples are discussed briefly here: linkages of ARkStorm precipitation and flooding data to (1) environmental lithology databases and (2) National/State scale environmental facilities databases.

Linkages to environmental lithology maps. Environmental lithology maps can be derived from State digital geologic map databases to show the distribution of rock types that could serve as nonpoint sources for potentially hazardous materials released into the environment as a result of ARkStorm-triggered runoff and erosion. For example, certain types of rocks naturally contain high levels of iron sulfides (pyrite, FeS2, also known as fool's gold) and trace metals such as copper and zinc. Weathering and oxidation of these rocks can produce natural acid-rock drainage with a wide variety of elevated metals that can be detrimental to aquatic organisms. Watersheds where abundant outcrops of these rock types coincide with high rainfall or snowmelt (such as ARkStorm) would, therefore, be at higher risk for storm-related release of acid-generating rocks by landslides

or erosion into downstream areas, amplifying the environmental impacts of the natural acid-rock drainage. However, it is likely that such effects would be localized largely in the watersheds close to where the rocks outcrop. Another example that has occurred elsewhere is the storm-related dispersal of asbestos into the environment from landslides in ultramafic rocks; however, the effects likely would be restricted to areas relatively close to the ultramafic rock outcrops.

Linkages to national- or state-scale facilities databases. A variety of state- to national-scale facilities databases can provide useful insights into the locations and types of industrial or other facilities with some potential for storm-related releases of contaminants into the environment. Examples of useful databases include the U.S. Environmental Protection Agency (EPA) Facility Registry System (FRS) database, State databases of land use and facilities such as animal feeding operations, and various USGS databases on historic and active sites of mining or mineral processing.

Wastewater treatment plants (WWTPs) are an example of a facility type that can be examined linking state- or national-scale databases to ARkStorm flooding and precipitation maps. As discussed earlier , WWTPs are more likely to be located in flood-prone areas, because the need to minimize pumping dictates that these plants be located at the lower elevations of the respective sewage system service areas. An analysis of the EPA regulated facilities database for California, in which WWTPs were extracted by using the key words or phrases “sewage”, “sewerage”, or “WWT”, identified more than 900 facilities across the state. Of these, a substantial fraction are predicted to be either within the plausible zone of ARkStorm flooding, or in predicted zones of maximum daily precipitation rates well in excess of 4 inches per day. Either result would likely lead to release of raw or partially treated sewage or other wastewater (along with contained contaminants and pathogens). Therefore, release of contaminated wastewater from flooded, shut-down, or overloaded WWTPs is a plausible and substantial environmental impact that likely would result in some areas of the State; geospatial analysis of the results highlights areas that are of higher concern than others. Such releases are commonly observed as a result of floods in the U.S. and worldwide, but effective hazards communication and preventative actions by emergency responders can substantially reduce the potential human health impacts. Further examination is warranted, however of potential ecological impacts from flooded WWTPs and other environmentally significant facilities near flood-prone areas. Many of the lowland, riparian, or lacustrian areas where floodwaters accumulate also are home to a wide variety of aquatic and terrestrial wildlife that could be affected adversely by floodwater-borne contaminants or pathogens.

Limitations: There are some substantial limitations in this approach that must be recognized and the appropriate caveats placed on interpretations and conclusions. A reconnaissance survey of a number of the databases used in the analysis reveals relatively common issues, such as incompleteness of coverage (for example, known facilities are missing), duplicate entries with different locations, and inaccuracy of geospatial location information for individual facilities of concern. Also, many databases lack specific information about the types of environmental contaminants that potentially could be released during an ARkStorm-scale event from specific source facilities. As a result, without extensive efforts to address such limitations, the use of state- to national-scale databases to map potential sources of storm-induced environmental contamination should be considered qualitative at best. Nevertheless, this qualitative approach does provide much useful information and also helps to fulfill a primary goal of this study, which is to identify areas where improvement in the approach for estimating plausible impacts is needed.

Public Policy Issues

Stated simply, public policy can be described as a predisposition of governments to act in a predetermined manner, although in actuality it is "whatever governments choose to do or not to do" (Newell, 2004, p. 153). Public policymaking in the U.S. is the responsibility of elected bodies, such as city councils, state legislatures, and the U.S. Congress. Managers of federal, regional, state, county, and city agencies also participate in policymaking, helping conceptualize and create policies. The policymaking process tends to evolve in response to societal or community problems perceived by citizens, interest groups, and political leaders. In a governmental context, it can be described as a cycle of (Newell, 2004, p. 153):

- Agenda setting, when issues are brought to the attention of policymakers,
- Policy formulation, when options are considered and a course of action is adopted,
- Implementation, when adopted policies are put into action, and
- Evaluation, when a policy assessment is performed, and ways to modify or improve policies are provided.

In the context of this policymaking process description, the ARkStorm policy assessment largely corresponds with the agenda and policy formulation stages. This assessment looks at the priority public policy issues highlighted by the ARkStorm scenario. These priority issues are organized around the basic functions of disaster management—mitigation, preparedness, response, and recovery, as well as risk awareness—a major behavioral factor in disaster management. In addition, this assessment also identifies an overarching policy consideration and identifies possible courses of action.

OVER-ARCHING POLICY CONSIDERATION

The ARkStorm scenario hypothesizes a disaster of catastrophic proportions for which existing national and state disaster policies are ill suited. Over the last 60 years, U.S. disaster policy agenda setting and policy transformations have occurred mostly during relatively brief periods of time – usually following disastrous events (Birkland, 2006; Rubin 2007). As Birkland advises "a disaster can often do in an instant what years of interest group activity, policy entrepreneurship, advocacy, lobbying, and research may not be able to do" (Birkland, 2006, p. 5). But, having relatively few major urban disasters within this timeframe suggests that these event-related policy changes mostly reflect the learning from far more moderate disasters.

The modern U.S. disaster management system works as a shared system in which over 88,000 local governments, special districts, and Native American tribal governments have primary responsibility for supplying disaster-related resources; federal, regional, and state agencies are to provide support as requested (Federal Emergency Management Agency, 2005). This shared system is triggered from the "bottom-up." Local governments are aided, as needed, by states, and both are aided, in turn, by the federal government. By design, the system requires extensive coordination and cooperation among all levels of government, as well as the many private organizations involved in disaster management. This process is also an incentivized system of partnerships, in that states and localities are encouraged, but not required, to participate.

Table 29 generalizes the current (2010) disaster policy framework in the U.S. for the basic disaster management functions, combining preparedness and response, and adding risk awareness. The basic role and responsibility of each level of public policy making—federal, regional, state, county, and localities—plus the private sector are described briefly. Some of the key policies evaluated in this assessment are articulated in the following legislation, doctrine, and programs:

National Flood Insurance Program (NFIP) provides flood insurance through the private sector, with backing by the federal government. Insurance also is reinforced by 100-year and 500-year floodplain mapping, together with rate reductions in relation to local government mitigation actions. Various types of flood mitigation and project grants also are administered. The NFIP represents the national position on "shared-risk." The government will help, but the aim is to encourage local governments and individuals to share flood risk.

Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) provides for individual and household assistance post-disaster, Public Assistance grants to restore damaged public facilities and infrastructure, and mitigation grants that fund both local hazard mitigation planning and projects to help strengthen communities against future disaster losses. Interacting with Stafford Act programs are the National Incident Management System (NIMS), providing a standardized nationwide protocol for managing response at each level of government, and the National Response Framework (NRF), which coordinates disaster response among federal agencies. These directives help further define federal response, recovery, and preparedness doctrine. The Post-Katrina Emergency Management Reform Act (PKEMRA) of 2006 modified the Stafford Act. PKEMRA directed FEMA to develop both a National Disaster Recovery Strategy and National Disaster Housing Strategy. FEMA finalized the National Disaster Housing Strategy in January 2009 (*http://www.fema.gov/pdf/media/2009/ndhs.pdf*). The National Disaster Recovery Framework (*http://disasterrecoveryworkinggroup.gov/ndrf.pdf*) is still under development.

Disaster Mitigation Act of 2000 (DMA 2000) requires local adoption of a FEMA-approved Local Hazard Mitigation Plans (LHMP) as a precondition for receipt of federal mitigation project grant funding. The act also provides a competitive Pre-Disaster Mitigation (PDM) grant program to fund local hazard mitigation planning efforts and mitigation projects.

State and local government programs include state and local emergency planning and use of the Incident Command System (ICS)/Standardized Emergency Management System (SEMS); statewide mandates for local safety element adoption; new requirements for linking floodplain mapping to land use, housing, safety and conservation elements; 200-year floodplain mapping in the Central Valley; and, various regional and local levee and water reclamation district formations.

In practice, current (2010) U.S. disaster policies and programs tend to work reasonably well in large-scale, noncatastrophic disasters, as well as in moderate and predominantly localized disasters. However, these policies and programs are not well-equipped to address catastrophic events that stretch societal resources. Disaster management tools and training tend to emphasize the delivery and management of federal and state assistance programs from a top-down perspective, rather than a more bottom-up view of communities as the "client." There have been repeated calls for greater flexibility and streamlined processes for local governments are needed to obtain federal and state assistance and a recommended broader use of the more flexible block grant forms of public financing in disaster recovery (Rubin, 1985; Olshansky and others, 2006; Smith and Wenger, 2007).

Table 29. Generalized framework for U.S. disaster policy at the federal level.

	Mitigation	Preparedness and Response	Recovery	Risk Awareness
Federal	-Provide federally-backed private flood insurance, 100- and 500-year floodplain maps, rate reductions linked to mitigation, and mitigation grants -Require state-local adoption of FEMA-approved hazard mitigation plans for mitigation grant eligibility -Provide state-local pre- and post-disaster mitigation project grants -Make building-site mitigation improvements reducing risks to federal infrastructure	-Implement National Response Framework (NRF), based on Incident Command System (ISC) principles: +Engage in partnership with state and local agencies +Establish a tiered response +Seek scalable, flexible, adaptable response +Establish unity of effort/ command +Foster readiness to act -Provide training and technical support for preparedness and response -Establish and support communication and information mechanisms	-Provide state and local assistance as requested -Provide assistance to state and local governments, Indian tribes or authorized tribal organizations, and certain specified private non-profit organizations for eligible emergency work and the repair, restoration, and replacement of public facilities and infrastructure damaged by a disaster event -Provide grant and loan assistance to individuals, families, and businesses for damages and economic losses caused by disaster -Provide limited resources for long-term recovery planning -Fund post-disaster mitigation to reduce future losses -Provide residential and commercial resources for recovery via the NFIP	-Create and administer public education programs to promote risk awareness that work at a national level, and also fund regional, state, and locally specific efforts. Examples: National Earthquakes and Wind Hazard Reduction programs -Limited funding for research and outreach on risk communication -Flood risk awareness is part of the NFIP advertising campaigns

Table 30. Generalized framework for U.S. disaster policy at the state level.

	Mitigation	Preparedness and Response	Recovery	Risk Awareness
State	-Make building-site mitigation improvements reducing risks to state infrastructure -Require counties and cities to adopt general plans, including floodplain mapping -Require counties and cities to approve developments consistent with general plans, and pay fair share of liability linked to development approvals in areas impacted by state flood control project failures -Provide 200-year Central Valley floodplain mapping, prepare Central Valley Flood Protection Plan, and map levee flood protection zones -Require Central Valley counties and cities and counties to amend general plans to conform with Flood Protection Plan and deny subdivisions in unprotected flood hazard zones	-Implement State Emergency Plan framework for disaster preparedness and response -Coordinate requests for federal assistance; utilize mutual aid regions and operational areas to support and coordinate federal and local response -Provide training and technical assistance to local agency response organizations -Coordinate NGO support for state and local response -Provide and coordinate the flow of information internally and externally to the public	-Provide state financial assistance to affected local governments for the repair, restoration, and replacement of public facilities damaged by a disaster -Administer federal recovery programs to repair public facilities and infrastructure and provide necessary additional funds -Coordinate federal assistance available for individuals, families, and businesses -Help administer federal programs for post-disaster mitigation	-Participate in national risk awareness programs -Create and administer public education programs to promote risk awareness, and also fund locally specific efforts. Example: Earthquake Country Alliance -Have state floodplain managers (add more if they do risk awareness work)

Table 31. Generalized framework for U.S. disaster policy at the local level.

	Mitigation	Preparedness and Response	Recovery	Risk Awareness
Local	-Make building-site mitigation improvements reducing risks to local infrastructure -Adopt state-mandated county and city general plans and building codes -Adopt FEMA-approved Local Hazard Mitigation Plans -Form flood control-levee districts and geologic hazard abatement districts	-Have primary responsibility for disaster response -Establish priorities for allocation of personnel and resources -Provide information and locally-based assessments -Request assistance and mutual aid by using tiered relationships -Obtain and disseminate information to the local public -Coordinate laterally with local non-governmental organizations (NGOs), community-based organizations (CBOs), faith-based organizations (FBOs), medical providers, other local agencies, and private sector -Coordinate vertically with federal and state agencies/responders	-Primary responsibility for recovery; request federal and state assistance as necessary	-Participate in national and state risk awareness programs -Limited examples of locally created and administered risk awareness programs. -Disclose flood risk as part of land development and other locally controlled development review.

Table 32. Generalized framework for U.S. disaster policy at the private level.

	Mitigation	Preparedness and Response	Recovery	Risk Awareness
Private	-Sell NFIP flood insurance and fire insurance with graduated mitigation-based costs -Make building-site mitigation improvements reducing risks to private utility-owned infrastructure -Make building-site mitigation improvements reducing risks to private property	-Coordinate with local agency responders -Provide resources for support of local and regional response efforts -Provide information to emergency responders -Coordinate communication with local businesses and organizations -Coordinate vertically with corporate parent and partner entities and organizations	-Businesses and individuals provide resources for recovery through insurance, grants, and reserves -Non-governmental and philanthropic organizations provide resources for recovery through donations, services, and grants	-Mortgage lenders disclose flood risk in NFIP mapped areas -Private insurance promotes risk awareness as part of the underwriting process -Limited examples of non-profit organizations that have been created to promote two-way risk communication for their particular hazard.

The ARkStorm scenario is an extreme event that, by its very nature, would not fit well within the current U.S. disaster management system and policy framework. Flooding from the ARkStorm scenario could inundate a great portion of California over 300 miles long by 20 miles wide, take several months to return basic levels of infrastructure service, seriously disrupt commerce and government, affect one in four homes over large areas, result in more than $300 billion in damages, and affect millions of people.

Local governments—the "first responders" and the backbone of the federal and state disaster management system, would likely be overwhelmed in managing response and recovery from such a scenario. State response systems that are designed to share resources in a mutual aid system between the northern, southern, and Central Valley regions of California also would be challenged to meet the simultaneous statewide demands of this scenario that will have cascading impacts that can impede response and recovery efforts for weeks, even months.

The excessive damage and loss levels estimated for the ARkStorm scenario are also a good indicator of the current (2010) inadequacies in federal and state programs to mitigate potential disaster losses (pre- and post-disaster mitigation funding), as well as a general absence of risk awareness promotion for such a low-probability/high-consequence event at all policy levels. An overarching risk awareness challenge is to reach the general public, as well as the special interest sectors, and the multiple levels and types of governments that will be affected by such a scenario. The catastrophic disaster depicted by the ARkStorm scenario requires moving beyond the event horizon perspective in place and considering scenarios that challenge the currently acceptable levels of response and preparation. The levels of severe disruption depicted by the ARkStorm scenario may require new levels of acceptance of loss and more attenuated systems of response thinking.

PRIORITY POLICY ISSUES: MITIGATION

Hazard mitigation is a disaster management function ideally preceding, and lessening the impacts of, disasters. FEMA defines hazard mitigation as "sustained action taken to reduce or eliminate long-term risk to people and their property from hazards." Mitigation speaks to interrupting the expensive and often repetitive cycle of disaster losses and reconstruction. (*http://www.fema.gov/plan/mitplanning/*).

According to the State of California Multi-Hazard Mitigation Plan, mitigation generally involves reducing long-term risk from hazards to acceptable levels through measures modifying physical development to be more resilient. Examples include strengthening structures to withstand earthquake shaking, minimizing development in flood-prone areas, clearing defensible space around residences in wildland-urban interface (WUI) areas, or steering development away from geologically unstable hillsides.

Mitigation reflects governmental and private sector expenditure of varying sums of money. Mitigation has been shown to be a sound investment with the Multi-Hazard Mitigation Council (MMC) study revealing a 4:1 overall loss avoidance ratio obtained from FEMA grants from 1993-2003 (Multi-Hazard Mitigation Council, 2005; Rose and others, 2007). In short, every dollar invested in mitigation saved four dollars of potential losses; greater savings were estimated for the subset of grants that dealt with flooding. These findings can be stated simply through the principle "pay now to mitigate, or pay a lot more later on for recovery."

Mitigation policy issues are found at all geographic levels and in multiple sectors. National mitigation laws and authorities generally authorize financial support to state and local governments and, in the case of flood insurance, to the private market supporting mitigation actions geared to preventing or minimizing disaster losses in advance of disasters (pre-event mitigation), or reducing repetitive future losses after disasters (post-event mitigation). Primary federal legislation fostering mitigation includes the National Flood Insurance Act (1968), the Stafford Act (1988), and the Disaster Mitigation Act (2000). In turn, these federal laws tend to be mirrored in state laws, and in many states, in local mitigation laws and policies leading to strengthening community resiliency.

Mitigation policy issues tend to be rooted in the specifics of federal-state mitigation laws. However, key overarching mitigation policy issues include the following: (1) insufficient mitigation funding, (2) levee failure impacts,(3) variable mitigation performance, (4) poor community impacts, and (5) landslide, mudslide, and debris flow issues.

There is insufficient funding to effectively mitigate the potential impacts and losses associated with the ARkStorm scenario. The ARkStorm scenario suggests a long-range mitigation requirement in the tens of billions of dollars or more that would take at least many decades to mitigate at current funding levels. The general policy question raised is whether funds should be authorized to close that funding gap in fewer years?

How can pre-event mitigation funding be increased to more adequate levels? The primary pre-event policy question raised by this scenario is what level of mitigation funding would be sufficient to help prevent or substantially reduce a loss of this magnitude? Presently (2010), federal, state and local mitigation actions are under-funded in relation to potential aggregate loss exposure. For example, the Pre-Disaster Mitigation (PDM) grant funds, an innovation introduced under the Disaster Mitigation Act, are usually funded at an annual level of only $100 million for the entire nation, an infinitesimally small amount in relation to the entire need.

How can post-event mitigation funding be enlarged and better focused? A post-event recovery policy question would be how to fund mitigation in order to reduce or minimize repetitive losses in the future, while absorbing the post-disaster costs of the losses incurred? Linking this to recovery, a corollary policy question would be how to reconcile losses of such magnitudes with standard Stafford Act relief funding levels ($28,800 maximum per household), and other sources, such as USDA, Small Business Administration, and NFIP assistance that would most likely become available after the scenario event?

Levee system vulnerability to potential failures and escalated losses from an ARkStorm scenario needs to be substantially reduced. The ARkStorm scenario includes multiple levee failures that would flood large areas in Flood Insurance Rate Map (FIRM) map Zone X previously thought to be protected from 100-year storms by levee systems. In 2005, Hurricane Katrina demonstrated the vulnerability of communities living behind levees built over time without sufficient attention to engineering standards assuring adequate performance under extreme conditions.

Extensive levee failure in New Orleans led to a nationwide reexamination of levees by the U.S. Army Corps of Engineers. In 2006, California it led to California voters' approval of $4.9 billion in bonds primarily for strengthening levees in the San Francisco Bay – San Joaquin Delta (Bay Delta) area. New Orleans levee failure also led, among other things, to legislation promoting: state 200-year floodplain mapping in the Central Valley; requirements for local governments to include floodplain mapping in general plans; and requirements that Central Valley communities deny subdivisions in unprotected flood hazard zones.

According to the California Multi-Hazard Mitigation Plan, substantial parts of the Bay Delta area are below sea level and currently reliant for flood protection on public and private levees built out of dredged sand for the purpose of protecting agricultural activities in the early 20th century, and are, therefore, susceptible to failure from earthquakes and other factors (California Governor's Office of Emergency Services, 2007).

Primary mitigation policy questions associated with levee failures include the following:

Who pays the bill for levee strengthening? A primary pre-event policy question related to added levee protection is availability of additional funding. The $4.9 billion authorized by the 2006 bond election is said to represent about 1/10th of the overall amount needed to help create a more stable levee system in the Delta. The question of additional sources of funding for levee strengthening so far has been addressed on a regional and local level through promotion in recent years of benefit-assessments placing additional fees on property for local levee improvements. The major policy question remaining is whether a California statewide fund for levee strengthening will be established.

What are the limits to development behind weak levees? An equally important policy question related to levee protection is whether development should be allowed to proceed behind levees that are susceptible to failure. This land use question is partially addressed by the new state-mandated requirements for inclusion of floodplain mapping in general plans and the assumption of partial liability where state flood control projects fail. However, suburbanization behind weak levees is likely to continue through local financial mechanisms such as Mello-Roos district formation for new development to levee strengthening costs. The policy question is whether development should happen before levees are strengthened or after?

The ARkStorm scenario would severely impact communities that have made sustained mitigation efforts, and those that have not. All communities in California are required to adopt general plan safety elements, and are subject to the requirement for consistency with the

general plan of zoning, subdivision, and capital improvements decisions. All communities must include floodplain mapping with the general plan (Assembly Bill 162 – 2006). Though local governments are equally subject to such state laws, their mitigation performances tend to vary. A review of 436 FEMA-approved Local Hazard Mitigation Plans (LHMPs) to qualify for federal hazard mitigation grant project funds showed variable degrees of conformance with Disaster Mitigation Act criteria (California Governor's Office of Emergency Services, 2007). Policy issues regarding local mitigation performance revolve around the question of what to do about under-performing communities.

Should only good performers be rewarded? The current (2010) competitive mitigation grant funding systems under the Stafford Act and Disaster Mitigation Act tend to reward good mitigation performance through additional funding. However, the ARkStorm scenario suggests that flooding and other damages would affect homeowners and businesses both in communities that have performed well and those that have performed poorly in hazard mitigation. The policy question is to what extent should grant funds be awarded to localities that have made sustained mitigation efforts over time versus those that have made unwise development decisions or acted carelessly in areas susceptible to substantial flooding or storm-related hazards?

Should hazardous areas in under-performing communities be bought out? It may be cheaper in the long run to buy out flood or landslide prone land in under-performing communities to avoid greater recovery costs later. In either case, policy solutions should be devised by which such differences between well-performing and under-performing communities can be reconciled in advance of an ARkStorm event. An examination of Severe Repetitive Loss Communities under the National Flood Insurance Program (NFIP) may provide some clues. From another perspective, a community may want to undertake significant mitigation activities, but lack financial means to do so. This is definitely the case with a potentially large number of rural, Central Valley communities. This issue of disproportionate impacts on poorer communities is further addressed below.

How should local financial liabilities be shifted? In the ARkStorm scenario many cities and special districts may fail financially as there will be little or no license or sales tax revenue or other normal revenue flows. In an event of this magnitude, the federal and state governments may find it necessary to support local functions and services in many communities. Although the state would still have substantial capacity to provide support to localities, resources would be seriously stretched. Traditional local-to-local assistance normally deployed in emergencies through mutual aid agreements may help buttress and sustain certain shared local services. Such arrangements would probably survive and be operable to some degree. The costs of such actions would be far reaching. Some thought needs to be given to how to underwrite combined large-scale local government financial failure. One area of enhanced federal support might be the FEMA Community Disaster Loan Program, designed to provide assistance for local government revenue losses. This program has been used infrequently in California. One challenge is how to make local governments more aware of this program so they can use it in an effective manner.

Like other disasters, the ARkStorm scenario would have a harsher impact on poor communities than those that are better off. The effects of ARkStorm would be more devastating for poor communities, making it harder for those communities to recover. The 2007 review of 436 FEMA-approved LHMPs indicated that communities that had not prepared an LHMP tended to be smaller and have higher percentages of households below the poverty line than those that had prepared one (California Governor's Office of Emergency Services, 2007). Yet Stafford Act and Disaster Mitigation Act offer no subsidies to assist poorer communities with pre-disaster mitigation or with post-disaster mitigation or recovery funds. With a long-range mitigation need under this scenario representing tens of billions of dollars or more, poor communities are less likely to be successful in securing post-disaster mitigation funds and preparing LHMPs during the pre-disaster

period. During the post-disaster period poor communities would have to struggle harder to prepare LHMPs to qualify for both mitigation and certain recovery project grants.

The primary policy issue regarding mitigation in poor communities centers on the question of whether to create explicit new efforts to help bring those communities along.

Should special consideration be given to poor communities? The policy issue raised would be whether poor communities should be provided special consideration in competing for pre- and post-event mitigation planning and project grants because of their economic circumstances?

Should poor communities be provided subsidies? Another policy issue raised is whether poor communities should be financially assisted to help prepare LHMPs before a disaster, thereby, equipping those communities with the means by which to more readily secure post-disaster mitigation grant funding with less delay.

PRIORITY POLICY ISSUES: PREPAREDNESS AND RESPONSE

The structure of emergency response established at the federal level in the National Incident Management System (NIMS) and National Response Framework (NRF), and carried forward by the state and local agencies through use of the California Standardized Emergency Management System (SEMS), is predicated on these principles (Federal Emergency Management Agency. 2008b):

- Engaged Partnership
- Tiered Response
- Scalable, Flexible, and Adaptable Response
- Unity of Effort/Unity of Command
- Readiness to Act

In practice, "Engaged Partnership" involves vertical coordination among federal, regional, state, and local agencies, along with lateral coordination among the various levels of public agencies with private sector and nongovernmental organizations (NGOs). The nature of a disaster is that all entities in an affected area instantly have to relate to one another; the intent of the "Engaged Partnership" principle is to anticipate and structure the relationships and interconnectedness of needs, roles, and responsibilities in advance.

"Tiered Response" is built on the premise of avoiding overlap and establishing lines of authority and communication along the vertical continuum from the local up to the federal level. The idea is that the local actors are the most knowledgeable and should be in charge of the disaster response and then request upward for federal and state assistance. This premise also involves the "Unity of Command Principle", the idea being to avoid duplication in effort, confusion and overlapping/overstepping actions.

"Scalable" is a key aspect of the incident command system. The structure is intended to remain the same regardless of the size or type of event. Roles and relationships are clearly outlined and remain the same in any scale of disaster; all that needs to happen is to apply the right amount of resource to the level of the event.

"Readiness to Act" refers to the need to train and prepare so that the emergency responders understand the system at their own level, and are prepared to coordinate through the chain of coordination envisioned in the "Engaged Partnership".

What is apparent in practice is that coordination, information flow, and communication are the fundamental blocks determining the effectiveness of the response. Under normal circumstances, coordination and communication within and among government agencies is challenging; a disaster simply amplifies the challenges; however, the clarity of the Incident Command System embedded in disaster response is intended to highlight channels of communication and information flow.

A second key element is the high level of responsibility delegated to the local agencies to manage the disaster. This means that effectiveness is dependent first and foremost on the capacity and capability of the local actors on the scene.

The ARkStorm scenario unfolds a disaster of a huge scale, potentially affecting millions of people with a wide swath of devastation that would disrupt all societal components—communications, transportation, and other infrastructure systems, in urban areas, rural areas, and in all manner of terrain. Secondary effects, such as debris flows and landslides would further complicate the picture. What this means for the principles and structures established for emergency response includes the following key considerations and issues:

Partnership: The ARkStorm scenario promises major disruptions to communications systems that are necessary for effective coordination.

- What will happen when elements of the communication network are broken or diminished in capacity?
- What will be the "work-arounds" necessary for the coordination to take place?
- What if the disruptions are for long periods of time, such as weeks or months?
- What are the implications for NGO and private sector partnerships and/or informal unstructured relationships that in a widespread disaster will place unprecedented demands for information and coordination?
- What are reasonable expectations for performance and resilience of communications systems in the event of a continuous series of disruptive storms?
- What are reasonably effective approaches to allow partial functionality of systems?
- What expectations and processes should be established to reverse the bottom-up management of a disaster when the local capacity is diminished or nonexistent? What are the appropriate shifting of roles of federal and state entities in such circumstances, and who would be empowered to make the decision to override fundamental local control?

Tiered Response/Scalability: The ARkStorm scenario would place potentially unprecedented demands on every level of government than experienced in the past. The response effectiveness will depend on the effectiveness of operations at each tier in the system. A fundamental assumption embedded in the response framework is that in fact the system structure can be effectively scaled up to a disaster of any size. The system is well-proven in limited emergency events. There are not many instances, however, of events as widespread in impact as ARkStorm supposes, and, therefore, the scalability of the system is not confirmed in practice. The system will only be as strong as its weakest link.

- Will local governments have functional capacity to effectively activate and operate the emergency response system?
- Will they be stretched so thin, or be so limited in resources that they lack the capacity and ability to manage the disaster and reach up the tiered response ladder? In that scenario, how will an intervention strategy emerge?
- Will federal and state response structures be so overwhelmed by the breadth of the event that their effectiveness is compromised?

- How will federal and state actors determine when and how to respond in a situation of multiple crippled local government agencies and/or a wide unevenness among various local actors?
- How will resources (equipment, supplies, personnel – all potentially scarce or not matched to need geographically) be allocated among multiple and competing needs?
- How will the need to reach far outside the area to mobilize and obtain needed resources affect the timing and delivery of support?

Unity of Command/Readiness to Act: The ARkStorm disaster, as anticipated, suggests that ad hoc organizational structures would be needed because of the widespread crippling effects of the devastation on the organizations and systems, such as mutual aid. Experience has shown that in some disasters, the responders established in the emergency response plan are not always the ones who end up with the key roles and responsibilities (for example, World Trade Center, Loma Prieta Earthquake). In these instances, ad hoc organizational structures were created by local leadership because - for any number of reasons - that proves to be the most effective way to proceed.

- How will unity of command be affected when people less trained are substituted into the response roles and systems?
- How will ad hoc structures be tethered to the command structure and tiered response system?
- What are effective ways of utilizing ad hoc community or private structures to take advantage of the capacities they provide?

PRIORITY POLICY ISSUES: RECOVERY

This section presents 6 policy issues:

1. Multi-governmental and agency communication and coordination challenges;
2. Post-disaster recovery financing challenges;
3. Gaps in policies and programs to handle the prioritization, funding, and execution of infrastructure recovery statewide;
4. Lack of plans for dealing with large-scale mass evacuations;
5. Absence of pre-event plans to handle short- and long-term housing needs and the restoration of community; and,
6. Challenges of large-scale and widespread redevelopment and changes in land use following an ARkStorm disaster.

The ARkStorm scenario would create a statewide catastrophic level emergency, with major issues of communication and coordination continuing far into recovery. A fundamental management underpinning of the disaster response and recovery framework in California is a shared mutual aid between northern and southern California. After the 1994 Northridge earthquake, northern California personnel supported mitigation and recovery functions of the state in southern California. Damage inspection also was supplemented after the 1994 earthquake with northern California inspectors working in southern California. This paradigm is well founded since there are few other natural disasters that would have catastrophic effects on a statewide basis. But, the ARkStorm scenario would pose significant response and recovery resource challenges statewide. It would require a great number of local districts and layers of agencies. In some cases, these organizations have not had adequate experience working in such extreme conditions as envisioned by this scenario. Breakdowns in communication and coordination are not going to be

limited to response; they will extend well into recovery as the "fog of war" will continue for many months, possibly years.

The ARkStorm scenario would generate unprecedented recovery financing challenges as the existing private and public recovery programs and resources would be woefully inadequate. The ARkStorm scenario could generate building repair costs exceeding $200 billion, which is equivalent to 5-10 years of construction at 2007 statewide building construction rates. There could also be flood-related content losses in excess of $100 billion, wind-related building repair costs of $6 billion, and hundreds of billions in business interruption losses. There would likely be significant challenges to recovery financing for all affected residential properties and tenants that do not have National Flood Insurance Program (NFIP) or other insurance coverage, small commercial and industrial business owners and property owners without NFIP or other insurance, small agricultural businesses, local governments, state government, nonprofits, and private utility providers. If the current (2010) economic recession and state and local budget crises are persisting when this scenario occurs, the catastrophic scale of this disaster could substantially accelerate these ex-ante conditions.

Scenario estimates are that NFIP penetration is quite low in the potential damage areas and would not cover the majority of private and public sector losses expected for the ARkStorm scenario. The NFIP is financially fragile as well, recovering from the multi-billion dollar shortfalls caused by the 2005 storms (Government Accountability Office, 2007a). Given the enormity of the potential ARkStorm-related losses, there could be post-disaster Congressional efforts to reduce the payouts on claims from such a scenario. Also losses associated with debris flows and landslides are not typically covered by the NFIP, so there would be significant unfunded gaps for these losses, too.

The Stafford Act provides federal supplemental assistance for individuals and families, government agencies, tribal organizations, and private nonprofit organizations. With millions of people potentially affected, an ARkStorm scenario could result in the largest-ever individual assistance payout. Public assistance is designed to cover emergency response costs and repair costs for public facilities and infrastructure, and tens of thousands of claims would be likely. Distribution of these funds could be a time consuming extensive process with the majority of funds being delayed until year two and three into the recovery, primarily because of the sheer volume of work created by a catastrophic event.

Also, the Public Assistance (PA) program that restores infrastructure is essentially a reimbursement-based program as administered by FEMA. State and local government agencies and other qualifying entities would be challenged, especially given the state's ongoing fiscal crises, to front-end the costs until reimbursements are made. Similarly, it is unclear whether the state and local government agencies would have the necessary funds to meet the required 25 percent match of the Stafford Act programs. It should be recognized that while reimbursement is the preferred method for funding PA costs, regulations give FEMA the authority to provide advances for immediate needs, as was done following the Northridge Earthquake when FEMA provided more than $100 million within a few days after the federal disaster declaration. Similarly, FEMA now has the regulatory ability to waive the local share and provide 100 percent funding for a limited period of time, usually for a designated emergency period.

The ARkStorm scenario also could result in a massive fiscal crisis for state and local governments as well as special districts struggling to meet the response and recovery needs of such a scenario, while simultaneously facing significant sales and property tax revenue reductions. The impacts could have cascading effects, as localities and special districts turn to state and county levels for financial assistance. While the state may be able to absorb costs of a few substate level units, a large group of failures may create a fiscal crisis for California.

The ARkStorm scenario estimates that private insurance would provide some resources to key sectors, particularly the medium and large commercial and industrial businesses, for structural and contents related losses related to flooding (that is, in excess of NFIP) as well as the limited amount of wind damage estimated. Similarly, higher valued residential properties (condominiums, apartment complexes, properties owned by real estate investment trusts) also tend to have excess-NFIP coverages. Local governments and private utility providers do carry some levels of insurance although the coverages are not likely to be sufficient.

But, long-term business and economic interruptions would largely be unfunded and restoration would be protracted. There would be significant and long-term transportation disruptions, interruption of supply lines and supply chains, and lost production (upstream and downstream) also would occur. Business interruption policies have time elements that would likely be exceeded by the ARkStorm scenario. Small Business Administration post-disaster loans would be a critical recovery resource for small businesses, and apartment owners, but these sectors would be challenged to accept additional debt burdens if real estate values are down and property owners are already upside-down on their loans. Businesses would be challenged to sustain themselves over a prolonged period of time with limited resources (both funds and supplies) and displaced markets.

Agricultural business recovery would face long-term changes, in restoring losses caused by floodwaters, addressing soil pollution and hazardous materials issues, and any longer-term delays in crop restoration and maturity. Post-disaster programs managed by the U.S. Department of Agriculture would be critical to this sector's recovery.

It is important to realize, however, that agricultural assistance programs are severely limited. First, they are loan programs requiring repayment and, as such, have rather stringent rules. Second, although these programs benefit farmers, few benefits flow to farm workers. The reality of a Central Valley flood will be the displacement of thousands of farm workers. Making this particularly tragic is that most farm workers do not qualify for government assistance programs because of the undocumented status of a large percentage. This tragedy adds a substantial social dimension to the ARkStorm scenario, placing tremendous pressure on CBOs and FBOs to provide post-disaster services. Meeting the needs of this particular group of survivors will demand a great deal of creativity and coordination between the government agencies and organizations serving the farm worker community.

Overall, there would likely be pressure placed on Congress to pass supplemental legislation, as it did with the 2005 Hurricane Katrina and other disasters, to provide post-disaster recovery resources to the state and local governments to help address the many recovery financing gaps generated by an ARkStorm disaster. Over $11.5 billion was appropriated by the federal government to the state of Louisiana through the Community Development Block Grant (CDBG) program, to fund a statewide housing repair program and supplement local government recovery following Hurricane Katrina (Government Accountability Office, 2007b). But, as with the state and local budget crises, current (2010) federal fiscal challenges may make such political action difficult to achieve following an ARkStorm scenario.

Current policies and programs are not adequate to handle the prioritization, funding, and execution of infrastructure recovery statewide. The ARkStorm scenario estimates flood-related damage to the Sacramento-San Joaquin delta system could interrupt water supplies to Central Valley agriculture and the southern California populace for at least 3 months. The cost and timing of system restoration involves complex levee repairs, dewatering, and land use issues. A host of policy issues are likely to arise, including: determining and allocating alternative, interim water supplies (for example, lottery and rationing); considering long-term sustainability issues (for example, wetlands restoration or diversion projects) within the accelerated timeframes and

heightened pressures to restore systems quickly; prioritizing island restoration and dewatering; determining agency responsibilities and coordinating actions and decisions; and, compensating for lost agricultural and economic production and land buyouts in areas that are not restored. California would likely face political challenges as it attempts to build support to finance the tens of billions of dollars needed for repairs to levees, dams, and other flood-control systems, amidst the state's perennial land and water wars and ongoing fiscal problems.

Road repairs, electric system recovery, and storm water and wastewater systems recovery, all would present management, coordination, financing, and interdependency challenges given the widespread and unprecedented scale of an ARkStorm disaster. The current (2010) state of U.S. disaster recovery policy is hampered by a conventional definition of "disaster recovery" as a return to pre-disaster status quo. Many of the major programs, such as the Stafford Act, emphasize repairs to pre-disaster conditions, rather than promoting infrastructure renewal, risk reduction, or betterment. Areas with older infrastructure would generally be more vulnerable to damage and agencies challenged to find funds to complete upgrades or enhancements. Road reroutings would be a major regional event; statewide, coordination is needed to keep commerce moving short- and longer-term and to help stimulate economic recovery.

There is a lack of policy and experience among state and local emergency responders and government managers in dealing with the complexity of mass evacuations, short- and long-term housing needs, and the restoration of communities statewide once the flood waters recede. The ARkStorm scenario could cause large-scale evacuations in the immediate wake of the storm that turn into long-term and protracted displacements similar to those following 2005 Hurricane Katrina. Extended displacements can lead to looting and extensive blight. Blight conditions could be significant in areas hit-hard by the current (2010) real estate recession. Transient and highly mobile parts of the state population may not return. This occurred after the 1994 Northridge earthquake, when apartment dwellers quickly vacated damaged buildings and neighborhoods resulting in a "ghost town" apartment situation in neighborhoods across the San Fernando Valley and central Los Angeles (Los Angeles Housing Department, 1995). It is also important to consider the effects that business relocations may have on community recovery. State and local governments need a mechanism to involve the business community in long-term recovery planning and implementation.

There would also be substantial need for both short-term and long-term housing following an ARkStorm . Impacts of the recent (2010) economic downturn on the housing market and available housing stock post-disaster are extremely unclear. In some communities, rental housing is at a premium and vacancy rates are quite low, while in others, there is housing surplus. State and local agencies might consider how the current stock of foreclosed properties could be used for short-term housing. There would be challenges in matching short-term housing resources with the needs and resources of inhabitants. A system for allocating temporary housing also may need to be developed to equitably distribute housing resources.

Helping displaced individuals and families to return and re-inhabit neighborhoods would require coordination and resources (maintaining information on displaced individuals, communications and outreach to the displaced, providing both short- and long-term housing options, and systems for allocation). Case management is currently handled through various post-disaster programs (FEMA individual assistance and temporary housing assistance, CDBG section 8 housing vouchers) and generally does not provide an integrated means of tracking people long-term or helping restore their lives (General Accountability Office, 2009). While this lack of coordination has been a sore point for some time, this may be changing in that FEMA is now negotiating with states to cover some of the cost of case management activities. This assistance is particularly important when considering the complex work of long-term recovery.

There may also be hazardous materials and public health issues to consider as part of the community restoration process. Contaminated water could affect soils and structures inundated by flooding. Policies and programs may need to be developed to address the removal of contaminated topsoil, and the detoxification of concrete and other affected building materials. There could also be policy issues of liability, litigation, and insurance coverages.

Large-scale and widespread redevelopment and changes in land use may be quite significant following the ARkStorm scenario. Properties that are more than 50 percent damaged are supposed to have flood risk mitigation as part of rebuilding under the National Flood Insurance Program (NFIP). The ARkStorm scenario estimates that 25 percent of the buildings in the impacted area would have some flood damage (1 percent light damage, 22 percent extensive, and 2 percent complete). Policies would need to be developed by state and local agencies to handle the moderately damaged buildings and enforce the NFIP requirements for 50 percent or greater damaged structures. Local governments (county and city) may be pressured to make less than 50 percent determinations so that people can rebuild to pre-disaster conditions. There may also be pressure to modify federal and state policies and make exceptions for an extreme event, like the ARkStorm disaster. There could also be challenges to fund mitigation options of relocation and redevelopment of buyout areas, structural elevation, or retrofitting of slab-on-grade foundations. A statewide or regional coordinating, or advising, body may be needed to help craft policy and coordinate financing and technical assistance to local governments. The state has some legal mechanisms in place (including state redevelopment legislation, geologic hazard abatement districts, and the Disaster Recovery and Reconstruction Act) that could aid in these kinds of efforts.

PRIORITY POLICY ISSUES: RISK AWARENESS

This section presents the following policy issues: building awareness of catastrophic floods and atmospheric rivers; speaking with a common voice; and building constituencies that can carry the message forward over time.

Building awareness of catastrophic floods and atmospheric rivers: "the big one." The challenge is to include catastrophic disasters in the policy dialogue at all levels of government, and in national organizations. Risk awareness of catastrophic disasters receives little to no attention. Why? This is, in great part, because of the infrequency of the event, the local nature of such events, and the issues of estimating the event impacts in physical, social, economic, and government functions terms. When a hypothetical disaster is very large, people tend to discount its likelihood. (Paine, 2002). The effort to simply agree on common integrated multi-level government approach to moderately sized disasters is still being debated.

An important function of risk awareness is to enhance the capacity of a person, household, or governmental unit to make informed resource allocation choices. As people become more aware of the ARkStorm event, the likelihood is greater that they may decide to invest in resiliency actions, particularly if it is understood that a small investment made now in preparedness or mitigation will reduce post-event losses and potentially yield large benefits. For example, an individual may buy a rubber raft to keep in the garage. A fire department may invest in a bulldozer rather than another fire truck. Or a city council may see that open-space land acquisitions can be part of a larger groundwater retention or flood diversion strategy. The more coordinated and publicized such efforts, the more likely the efforts can contribute to a common awareness and belief in the benefits of risk reduction behavior.

The "Risk Awareness" part of the FEMA Risk MAP (Mapping, Assessment, Planning) Program awaits implementation. Nowhere in the Risk MAP plan are catastrophic disasters emphasized as an area to be addressed. The Risk MAP theme to "clearly and effectively inform the

public of their flood risk and impacts" does exist, and forms the basis for including catastrophic atmospheric river and flood events (*http://www.fema.gov/library/viewRecord.do?id=3587*).

One Risk MAP objective is to measurably increase the public's awareness and understanding of risk. When operational, this objective can be used to support the policy needs of the ARkStorm scenario through providing map-based information on disasters of this scale and impact. Another federal effort—the draft National Disaster Recovery Framework– does recognize scalability and a potential for regional approaches; but does not speak to risk awareness.

At the national special interest group level, the Association of Flood Plain Managers, for example, does not mention such extreme events like the ARkStorm scenario in any of their national policy statements. At the state level, the California Department of Water Resources (DWR) Division of Statewide Integrated Water Management is seeking to provide consultant support on various themes including how to communicate statewide flood risk, but does not mention catastrophic disasters in any of its public documents.

To build awareness of the "big one," in this case the ARkStorm scenario, requires overcoming a common human tendency of "out of sight, out of mind." An event with a low probability of occurrence in 200, 500, or 1,000 year timeframes is not part of everyday thinking. Large-scale floods, however, continue to be common in the U.S., with the 2010 Nashville floods that caused 30 deaths, the 2009 Iowa floods, and Hurricane Katrina as examples. But these are thought of in the popular mind as "rare" occurrences. While the policy formation process must account for basic individual behavior it can also take a long-term view of awareness, as in the case of the 30-year old National Earthquake Hazards Reduction Program (NEHRP) (*http://www.nehrp.gov*), whose goals include improving the earthquake resilience of communities nationwide.

Speaking with a common voice: Getting the message straight is a key policy challenge. To raise awareness, the message must be consistent and clear. It is a challenge to get the message straight when the federal government does not control land use at the state level, but does work in partnership with states and cities, by providing information (for example, NOAA) and incentives for participation (such as the Disaster Mitigation Act of 2000). There is a "unity of effort" concept embedded in the draft National Disaster Recovery Framework, and the Post-Katrina Emergency Reform Act of 2006. The latter does includes catastrophic events in the act text.

The basic ARkStorm risk awareness message must go to people's core survival values and tell them that they will suffer severe personal and economic losses directly and indirectly. At the household level, families would suffer along with their neighbors. To lessen the danger and impact, they would need to support local disaster mitigation actions, call for actions to be taken, and to prepare themselves (such as through self-training, obtaining insurance, flood-proofing their homes and businesses, knowing how to evacuate, having survival supplies at hand, and being able to communicate with local authorities and neighbors). As people and governments would be working to avoid and prepare for an event that has not been experienced in living memory, the message needs to be implanted in all levels of personal and civic life. Community-based disaster response has been on the upswing in recent years (for example, neighborhood Community Emergency Response Teams (CERT)). Outreach and communication issues extend from major media to individual volunteers.

Effective messaging must be consistent, unrelenting, and come from multiple sources. People respond better to graphic images than numerical data regarding risk. Thus message transmission needs to be more visual, and better maps and imagery do help. People have difficulty dealing with probabilistic information; low probability events become "zero probability events" in people's minds (Kunreuther and others, 2004). They need a context in which to evaluate the likelihood of a disaster occurring. Obtaining and disseminating information is one of the most

critical aspects of any disaster, and how it is handled can either support or undermine other emergency response operations.

Risk perception and risk reduction actions tend to be influenced by culture (Weber and Hsee, 1998). People from different cultural backgrounds may perceive risk differently and act differently when a large loss is incurred. In shaping a common message it is important to understand how different groups perceive risk reduction. Thus, in more culturally diverse regions, such differentials should influence message formation and dissemination. Outreach needs to be done with heterogeneity in mind.

Observations of the Gulf Coast oil spill suggests that elected officials were not prepared to coordinate or to establish a common voice. This lack of preparedness leads to confusion, and raises the anxiety level for all involved. Such an event had not been anticipated, nor prepared for at the federal, state or local levels. For the ARkStorm message to be delivered with one unified political voice (at a federal, regional, or state level) some new programmatic efforts will be required, possibly championed by the California League of Cities and the California Congressional delegation.

Building constituencies that can carry the message forward over time. The policy issue here is the need to build the constituencies that support long-term messaging. The question here is who needs to be aware? In the absence of any existing coordination framework, the answer is everyone from the national level down to the local private business person needs to be aware of the ARkStorm threat. Such an effort might be started by FEMA as called for in the Stafford Act, Section 503 (b) to "lead the Nation's efforts to prepare for, respond to, recover from, and mitigate the risks of natural and man-made disasters, including catastrophic incidents" (Federal Emergency Management Agency, 2007, p. 94).

At the federal level, an opportunity exists to fashion a NEHRP-type effort to continually support science inputs. NEHRP, created by Congress in 1977, has among its objectives the collection, interpretation, and dissemination of information on earthquakes, and public hazard awareness; and to provide national and local leadership to engage communities in earthquake safety practices. A similar risk reduction program has been established for windstorm, but nothing yet exists for major flood hazards. Fashioning an ARkStorm policy effort along these lines would be useful and provide a legislative basis for action and funding.

The draft National Disaster Recovery Framework (NDRF) provides for catastrophic policy development. Recognition of "scalable" events provides a starting point. The NDRF is an emerging effort toward greater coordination among federal government recovery programs. NDRF also should be seen as a vehicle to improve risk awareness tools and build long-term consensus efforts. Additionally, the FEMA National Preparedness Directorate can play a role in increasing efforts to enhance risk awareness content in its member units.

At the state level, California has a variety of constituent building efforts for disasters. FloodSAFE (*http://www.water.ca.gov/floodsafe*) provides a starting point. The California approach addresses large flood danger at a regional level (for example, the Central Valley Flood Management Planning Program). These efforts do form the basis of constituency building. The FloodSAFE program in California, while focusing more on institutional units (such as local government, flood districts, irrigation districts), is building a message delivery system on a common theme.

People listen to other people who share common values and interests. In California, the FIRESafe council system (of which there are 150 local councils) is a model of people sharing common safety interests with other people. FIRESafe is a system of community based nonprofit organizations dedicated to reducing wildland fire hazard and improving fire-safety awareness (*http://www.firesafecouncil.org*). These organizations receive federal funding but are essentially

local based operations. Being local they have the advantage of talking directly to individuals about disaster fears and perceptions, and appropriate risk reduction actions.

California's Earthquake Country Alliance (ECA) is a form of coalition building along a common natural hazard danger (*http://www.earthquakecountry.info*). ECA is a statewide "alliance of alliances" linking the public information efforts of organizations and individuals that provide earthquake information and services. The main strategy of ECA is to coordinate the earthquake information, so that the public receives information that is consistent, from multiple sources they trust, through multiple channels, and serves all California residents.

Experience has shown that media statements, sloppy science, and inaccurate predictions easily distort catastrophic disaster awareness. A program of educating the media (including media meteorologists) can build pre-event alliances as part of the message delivery system. Lessons from the Pacific Tsunami Warning Center, which work on tsunami risk awareness, may yield lessons for ARkStorm (*http://www.weather.gov/ptwc/*).

If the saying "all recovery is local" has any validity, then the areas of highest ARkStorm impact require particular attention to promote a level of risk awareness that leads to risk reduction through mitigation and resiliency measures. Partnerships of awareness at the neighborhood level are required. These can be modeled after the Berkeley, Calif., program of neighborhood earthquake and flood training, and of disaster materials caches (*http://www.ci.berkeley.ca.us/disasterresistant/*). Such efforts would be focused on areas where the greatest chance of isolation might occur, and on making neighbors the first responders to the disaster. We also need to know more about how cities get motivated to become more "self-protecting." In Oklahoma, The Tulsa Partnership is an example of a nonprofit working in flood impact avoidance and preparedness that reinvents itself to assure continuous local involvement over time (*http://www.tulsapartners.org*).

POSSIBLE COURSES OF ACTION

The ARkStorm scenario aims to use science to inform decisions that enhance community resiliency, in this case resiliency against a winter storm causing a statewide disaster. ARkStorm represents an important wake-up call about the extensive devastation and long-term consequences an extreme event of this magnitude might cause. To actually enhance resiliency, however, will require significant disaster policy changes, programmatic adjustments, and organizational and individual behavioral adaptations will be required to face the immense challenges that such an extreme event poses. Some possible courses of actions that this assessment offers are as follows:

1. The ARkStorm scenario raises serious questions about the ability of existing national, state, and local disaster policy to handle an event of this large magnitude. The potential for extended disruption of all levels of government calls into question basic assumptions about mitigation and disaster management in existing emergency operation plans, general plans, and hazard mitigation plans policies and programs; Incident Command System protocols and National Response Framework emergency support functions; National Flood Insurance Program requirements; and Stafford Act requirements and programs (including mutual aid, Individual Assistance, Public Assistance, pre- and post-disaster mitigation funds). Federal, state, and local agencies may need to redefine what constitutes reasonable and effective mitigation, as well as emergency preparedness, response, and recovery expectations. Response, recovery and mitigation goals may need to shift and be prioritized to accept a greater breadth and duration of disruption and resulting impacts than previously considered with other disaster scenarios. For example, several ARkStorm participants highlighted the need to reconsider FEMA limitations on PA grants that fund restoration of public infrastructure facilities to no greater than pre-disaster conditions.

Local governments may not have the capacity to sustain response and recovery management for an extended period, and shifts in control and/or responsibility to other levels of government may be needed. Minimum, stop-gap measures and more flexible, ad hoc systems of communications and emergency response and recovery operations also may need to be established.

2. A core policy issue raised by this extreme event scenario is whether "to pay now to mitigate, or pay a lot more later for recovery." The high level of damage and uninsured losses estimated for this scenario are good indicators of the current policy and program gaps for addressing a low-probability/high-consequence event like the ARkStorm scenario. Careful consideration needs to be given as to what programmatic and policy approaches can be reasonably pursued in advance of an event of this size for cost-effective and reasonable risk reduction. Research has shown that, in addition to reducing the potential for a flood catastrophe, flood risk preparedness and mitigation can be highly cost effective on a benefit-cost-ratio basis (Multihazard Mitigation Council, 2005a, 2005b). Some reasonable examples of locally cost-effective pre-disaster action might include: moving local emergency operations centers and critical facilities out of floodplains, guiding development away from floodplains, adding access-evacuation points for areas likely to be isolated, and modifying local flood works to reduce impacts. But addressing statewide levee system vulnerability to reduce potential failures and catastrophic losses anticipated with an ARkStorm scenario cannot be addressed on a regional and local level as has been tried in recent years; a California statewide fund for levee strengthening may be necessary.

3. Innovative financing solutions are likely to be needed to avoid fiscal crisis and adequately fund response and recovery costs from an ARkStorm scenario disaster. The protracted and cascading effects of damage and impacts resulting from this scenario may lead to a massive fiscal crisis among affected localities and special districts struggling to meet the response and recovery needs of such a scenario, while simultaneously facing significant sales and property tax revenue reductions. The impacts could have cascading effects, as localities and special districts turn to county and state levels of government for financial assistance.

4. Responders and government managers at all levels could be encouraged to conduct self-assessments, and devise table-top exercises, to consider how the intensity and breadth of the ARkStorm scenario could challenge current (2010) assumptions in emergency response and planning documents, as well as organizational structures and systems, and their abilities to scale up and meet the needs of such a disaster, and the unexpected new work such an event will demand. Such assessments and exercises could help to create more locally- and regionally specific scenarios of impacts, and also produce inventories of resources (for example, public and private sector, equipment and trained personnel) that may be needed to adequately respond to, and recover from, an extreme event, as well as gaps in public and private sector resources available. Political leaders, policy makers, and administrators could be involved in such assessment and exercises.

5. ARkStorm can become a reference point for application of FEMA and California Emergency Management Agency guidance connecting federal, state, and local natural hazards mapping and mitigation planning under the NFIP and Disaster Mitigation Act of 2000. It identifies the importance of connecting this scenario to the evolving NFIP 100-year flood risk mapping, assessment and planning (Risk MAP), to California Department of Water Resources 200-year floodplain mapping, and to local hazard mitigation plans under the Disaster Mitigation Act of 2000; and the importance of examining California statutory requirements relating flood hazard mapping to local general plans.

6. Common messages to educate the public about the risk of such an extreme event as the ARkStorm scenario could be developed and consistently communicated to facilitate policy

formulation and transformation. Federal, state, and local models (such as for earthquake, fire, and windstorm) exist for crafting and executing a risk awareness program for an extreme event like the ARkStorm scenario. Multi-level, multi-actor involvement needs to be a core component of such an effort.

Summary

KEY FINDINGS

1. **Megastorms are California's other "big one."** A severe California winter storm could realistically flood thousands of square miles of urban and agricultural land, result in thousands of landslides, disrupt lifelines throughout the state for days or weeks, and cost on the order of $725 billion. This figure is roughly 3 times that estimated for the ShakeOut earthquake, another planning scenario reflecting an earthquake with roughly the same annual occurrence probability as an ARkStorm-like event. The $725 billion figure comprises about $400 billion in property damage and $325 billion in business-interruption losses. An event like the ARkStorm could require the evacuation of 1,500,000 people. Because the flood depths in some areas could realistically be on the order of 10-20 feet, without effective evacuation there could be substantial loss of life. These impacts are not exhaustive: they do not consider tourism and recreation, loss of cultural value as a result of damage to historic artifacts and buildings, Native American burial grounds, or museum contents. Quite significantly, we have not addressed many aspects of public health, such as drowning victims and mental-health effects of the storm, which would likely be substantial.
2. **An ARkStorm would be a statewide disaster.** Extensive flooding is deemed realistic in the California Central Valley, San Francisco Bayshore, Los Angeles and Orange Counties, several coastal communities, and various riverine communities around the state. Both because of its large geographic size and the state's economic interdependencies, an ARkStorm would affect all California counties and all economic sectors.
3. **An ARkStorm could produce an economic catastrophe.** Perhaps 25 percent of buildings in the state could experience some degree of flooding in a single severe storm. Only perhaps 12 percent of California property is insured, so millions of building owners may have limited or no ability to pay for repairs. That degree of damage would threaten California with a long-term reduction in economic activity, and raise insurance rates statewide—perhaps nationwide or more—afterwards.
4. **An ARkStorm is plausible, perhaps inevitable**. Such storms have happened in the California historic record (1861-1862), but 1861-1862 is not a freak event, not the last time the state will experience such a severe storm, and not the worst case. An ARkStorm would be unlike any storm that has occurred in living memory: 6 megastorms that were more severe than 1861-1862 have occurred in California during the last 1800 years, and there is no reason to believe similar storms won't occur again. There may be no pattern that forces the storms to occur with clockwork regularity, so such an event could occur in any year.
5. **The ARkStorm is to some extent predictable.** Unlike earthquakes, for the ARkStorm there exists a capability to partially predict key aspects of the geophysical phenomena that would create damages in the days before the storm strikes. While these predictive systems already have some important capabilities, there could be great benefit in enhancing their accuracy, lead time, and the particular measures they can estimate. This represents a great challenge scientifically and practically. A game-changing attention to this problem is needed, likely of a scope similar to what is currently done for hurricanes and tornadoes.
6. **California flood protection is not designed for an ARkStorm-like event.** Much has been done to protect the state from future flooding, but the state flood-protection system is not perfect. The existing systems are designed, among other things, to protect major urban areas from fairly rare, extreme flooding. The level of protection varies: some places are protected from flooding that only occurs on average once every 75 years; others, on average every 200 years. But the levees are not

intended to prevent all flooding, such as the 500-year streamflows that are deemed realistic throughout much of the state in ARkStorm.

7. **Planning for ARkStorm would complement planning for earthquakes.** The ShakeOut exercise has become an annual activity in California, with more than 6 million people participating each year. Many of the same emergency preparations are useful for a severe winter storm: laying in emergency food and water, shelter preparations, exercising emergency corporate communications, testing mutual aid agreements, and so on.
8. **Those considering flood mitigation should consider ARkStorm.** Governments, businesses, public and private utilities, and individuals have the opportunity now to explore the costs and benefits of physical improvements to their infrastructure to reduce future damage. As shown by Multihazard Mitigation Council (2005a, 2005b), flood risk mitigation can be highly cost effective, with benefit-cost ratios on the order of 5.0 or more. For instance, although enhancing state flood protection is very costly; not doing so may be even more so. Enhancing urban sections of the state flood protection system to 500-year levels could realistically cost $10s of billions. Not doing so could realistically cost $100s of billions when such a storm occurs.
9. **Hurricane Katrina is a relevant, cautionary experience.** Just under 1 year before Katrina, the USACE requested $4 million from Congress for a study on how to protect New Orleans from a category-4 hurricane, which, according to one recent estimate, would have cost on the order of $30 billion. Congress deemed the cost of the study to be too high at the time. The actual storm ultimately cost the federal government in excess of $100 billion, resulted in perhaps $150 billion in total economic loss, and killed 1,800 people. The alarm over the Californian flood-protection systems has already been raised; this study echoes prior ones.
10. **There are many ways in which scientific improvements could help to manage risk from severe winter weather.** Several research issues are raised by ARkStorm, such as the need for a statewide—or even nationwide—end-to-end stochastic model of severe weather, physical impacts, and socioeconomic consequences. Researchers identified the need for a convenient way to talk about the size of such a California winter storm; better elevation data and historic landslide maps to improve coastal inundation and landslide models; better asset location data in HSIP Gold to improve our understanding of essential facilities exposed to risk; and various reforms to NFIP.

CONCLUSION

The ARkStorm project was a primary focus of the Multi-Hazards Demonstration Project in 2010. Some 120 scientists, engineers, lifeline operators, emergency planners, and others from the private and public sectors collaborated on this depiction of a hypothetical severe winter storm. The storm is akin to a real one that occurred in California in 1861-1862, and 6 more-severe, real events of the past 2,000 years. The scenario is intended to inform community decision-making and help communities increase their resilience to severe California winter storms. It describes in granular detail: the meteorological mechanisms and measures of the storm; the resulting coastal and riverine flooding; windspeeds and landslides; the physical damage to buildings and other aspects of the built environment; the disruption to and recovery of affected lifelines; the impacts on agriculture; hazardous material and other public-health impacts; the costs to the California economy resulting from business interruption; the limited nature of insurance recovery; the enormous demands of evacuation and sheltering; and the public-policy implications and issues raised by the real potential for such a storm. The ARkStorm project produced the present report, and the following notable outcomes.

The Extreme Precipitation Symposium. The ARkStorm scenario was the theme of the 2010 Extreme Precipitation Symposium at the University of California John Muir Institute of the Environment. About 200 experts in science, flood management, engineering, and policy attended the symposium where the ARkStorm scenario was presented and discussed by panels of experts.

Largest HAZUS-MH loss estimate. Several groups have used the HAZUS-MH methodology to make loss calculations inside and outside of HAZUS-MH. However, the present study seems to be have produced the largest-ever building and content property loss ($305 billion) estimated using the HAZUS-MH methodology for a scenario natural disaster. It exceeds a $140 billion loss estimated for a hypothetical M 7.0 earthquake in the New York metropolitan area, and the losses in the ShakeOut scenario, which resulted in an estimated $33 billion in shaking-related damage to buildings and contents from a M 7.8 rupture of the Southern San Andreas fault.

Design storm. Toward the end of the project, the Art Center College of Design brought together over 30 leaders in emergency response, flood management, engineering, and earth and atmospheric science in an activity coincidentally called a design storm (the term is generic, and has nothing to do with weather nor the storm dealt with here) to help product-branding professionals and students develop a communication plan to improve public awareness of major winter storms.

ARkStorm Summit. An invitation-only conference will be held in cooperation with the California Emergency Management Agency (CalEMA) and Federal Emergency Management Agency (FEMA) in January 2011 in Sacramento where this report will be released. Participants will be policymakers, lifeline professionals, scientists, and executives from the public and private sectors whose responsibilities include community resiliency.

CoSMoS Modeling System. The ARkStorm scenario led to the development of the CoSMoS (Coastal Storm Modeling System) a model for analyzing the impacts of severe storms at present day and under various climate change/sea level rise scenarios. The impacts include flood hazard zones, beach erosion, cliff failure location, and the location of damaging wave conditions co-located with infrastructure such as piers, jetties, and breakwaters. The effort broke new ground on the West Coast where no such physics-based, process-based system previously existed. It has attracted attention from numerous agencies such as the United States Army Corps of Engineers, United States National Park Service, and FEMA, many of which want to see the model applied to their own areas of interest. The model is being used at the mouth of the San Francisco Bay, to estimate the impact of sea level rise and severe storms on the outer coast. It is the subject of several talks at the 2010 California and Worlds Oceans Conference.

Statewide landslide-susceptibility maps. Prior to the ARkStorm scenario there had been few previous studies that mapped landslides triggered by individual storms, and even fewer that tallied the amount of damage done by landslides. Research for the ARkStorm scenario led to the development of two maps that show large areas of California that are susceptible to landslides. These landslide-susceptibility maps are the most detailed ever created for the state. Through ARkStorm, researchers gathered data on past landslides and damage from numerous sources, and estimated that the cost to repair damage resulting from landslides triggered by an ARkStorm.

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251035

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Comment on Policies

1 message

Stanley Price <2stanleyprice@gmail.com> Wed, Jul 23, 2014 at 3:22 PM
To: TGPA-ZOU@edcgov.us
Cc: Lindell Price <lindellprice@gmail.com>

In the Impact Analysis section:

Policies TC-4a through TC-4i and TC-5a through TC-5c need to include the words "complete streets". This is to inform policy users of the State law requiring the General Plan to accommodate all users.

In TC-4d, I request that bikeways will be included in the funding for the road project. Pursue any funding that can legally be used for bicycling facilities. Facilities for bicycling are not an option under Complete Streets.

Stanley Price
(530) 677-5052

251036

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Comment on Policy

1 message

Stanley Price <2stanleyprice@gmail.com> Wed, Jul 23, 2014 at 3:25 PM
To: TGPA-ZOU@edcgov.us
Cc: Lindell Price <lindellprice@gmail.com>

Policy TC-5c regarding sidewalks adjacent to schools needs to be expanded to "include roads providing access to schools and parks."

Stanley Price
(530) 677-5052

251037

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Wed, Jul 23, 2014 at 4:56 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

---------- Forwarded message ----------
From: francesca duchamp <francescaduchamp@att.net>
Date: Wed, Jul 23, 2014 at 3:50 PM
Subject: Comment on TGPA-ZOU DEIR
To: "shawna.purvines@edcgov.us" <shawna.purvines@edcgov.us>, "bosone@edcgov.us" <bosone@edcgov.us>, "bostwo@edcgov.us" <bostwo@edcgov.us>, "bosthree@edcgov.us" <bosthree@edcgov.us>, "bosfour@edcgov.us" <bosfour@edcgov.us>, "bosfive@edcgov.us" <bosfive@edcgov.us>, "edc.cob@edcgov.us" <edc.cob@edcgov.us>

Dear Ms. Purvines, First of all, I am not no growth--I am for responsible growth. I was here and supported the strip mall when it came, into Pollock. I just recently fought for the Family dollar store (because some of the people , some of the board seem to promote --were against it.) Our town needed this type of store (we did not need another restaurant.)...many have no money. So what I am going to say reflects the fact that after this many years...the closing of the mill still affects the economy up here. My own family member worked there once upon a time and was part of the huge lay offs.

3.2.2. Environmental Impacts
Targeted General Plan Amendments
 The project proposes to divide the existing Camino/Pollock Pines Community Region to create
three Rural Centers: Camino, Cedar Grove, and Pollock Pines. No changes would be made to the
current General Plan designations for parcels within the Community Region. However, the
General Plan's non-transportation noise standard applicable within Rural Centers is more
stringent (i.e., does not permit as much noise) than within Community Regions. As a result, new
development within the 170 acres of industrial land within the Camino/Pollock Pines

Community Region would be subject to the more stringent noise controls applicable to Rural
Centers. Future industrial development would therefore be required to comply with the more
stringent regulations. The more stringent noise controls may also apply to any future re-opening
of the Sierra Pacific Industries lumber mill in Camino, which would serve timber harvesting.

"The more stringent noise controls may also apply to any future re-opening of the Sierra Pacific Industries lumber mill in Camino, which would serve timber harvesting." I personally find this sentence insulting. We have been told over and over that SPI was not going to bring back a mill <---and we all now drive by the torn down space as a reminder. The people in Camino are already fighting over low income housing, strip malls, and museum with a small working mill <--to show what it was like in the "olden" days to go into that space. Even that aside, since running the 1 2 3 petitions--not telling anyone how to vote...I have been through some unbelievable things...the last having a non profit call the sheriff twice <--because they didnt know their own charter. The chair of CEDAC, along with others--one being SPI put together 70,000+ dollars to stop the petitions. This is an emotionally charged sentence. And it is wrong. I have supported many of the items that the BOS has brought into play...fixing roads, supporting the new cancer center...supporting the fact that you are elected officials. I think I have clearly stated that I dont care for lies and manipulations. If a mill ever comes back--im sure it can be reworked to fit in...since it was there originally.

This document was brought into existence on false numbers--guesses--forecasts. Still people do not know anything about it. Groups contain mostly the same people. Once again, some of the things that have gone on--spilt my space...torn it apart. Using the mill is just going to create more hate than needed. The 1400 + emails quoted... 1400/Registered Voters equals = 0.0130909635 <----doesnt show that many know whats going on.

I am also interested in the words Design and Aesthetics <-----who is addressing these definitions in terms of this document? And what are their qualifications to define these terms? Remember I support the Family Dollar Store...the building is ugly. One could not get mad at the designers--they did what they were told--go out and look at the environment. There are no up to

251037

date design guidelines (this applies to signage as well--what qualified people are working on these issues?)

I do still believe in government--that people do the best they can. I even believe that over time-- some can know more than others. I believe that fresh ideas promote healthly communities. I believe too much power corrupts. And I believe if one lie is caught--it can destory trust for good. But many times--im just shaking my head. Fran

--

Shawna L. Purvines
Principal Planner

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251038

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Re: Comment on LUPPU TGPA-Z OU Draft EIR

1 message

ststailey <ststailey@sbcglobal.net> Wed, Jul 23, 2014 at 9:55 PM
To: Joel Ellinwood <jellinwood49@gmail.com>, TGPA-ZOU@edcgov.us, Lori Parlin <info@shinglespringscommunityalliance.com>, Frank Verdin! <nosanstino@yahoo.com>

Thanks Joel, great letter.

Sent from my LG Optimus G™, an AT&T 4G LTE smartphone

------ Original message ------
From: Joel Ellinwood
Date: 7/23/2014 15:50
To: TGPA-ZOU@edcgov.us;Lori Parlin;Frank Verdin!;
Subject:Comment on LUPPU TGPA-ZOU Draft EIR

Please find my letter attached.

Joel Ellinwood, AICP LEED AP
Attorney at Law

Joel Ellinwood, AICP LEED-AP
Lawyer-Planner

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California land use & environmental law; urban and regional planning policy & advocacy for a more just and sustainable future

July 23, 2014

Shawna Purvines, Senior Planner
County of El Dorado
2850 Fairlane Court
Placerville, CA 95667

Re: Comment on Draft EIR Alternatives Analysis for LUPPU/TGPA/ZOU

Dear Ms. Purvines:

Under the guise of a purported CEQA alternatives analysis, the paid County consultants – under the supervision of County staff – prepared a preemptive and partisan political polemic against the citizen-sponsored initiative measures slated for the ballot in the November 4 general election. The authors appropriate the initiatives sponsored by Rural Communities United, Shingle Springs Community Alliance, Residents for Positive Planning, and Save Our County and put them forward as "project alternatives" under a false premise – that they are intended as alternative means of achieving the same objectives as the Land Use Programmatic Policy Update/Targeted General Plan Amendment/Zoning Ordinance Update Project ("LUPPU/TGPA/ZOU"). This is a highly questionable, if not illegal use of public funds. At the very least, it exposes the pro-development bias of the planning department and CAO office and its inability to provide an objective, fair-minded analysis of the initiative measures.

In fact, the objectives of the initiative measures and LUPPU/TGPA/ZOA are nearly diametrically opposed. The conclusion that the initiatives are not preferred or feasible alternatives because they don't achieve what LUPPU/TGPA/ZOU is intended to achieve is a tautology, not analysis. This is the rhetorical equivalent of asserting that oranges taste bad because they are not apples.

LUPPU/TGPA/ZOU reinforces and intensifies a policy program of unrestrained and unanalyzed high-density urban and suburban development within the "Community Regions" arrayed along Highway 50 from El Dorado Hills to Pollock Pines. Although defined in the 2004 General Plan as an "urban limit line," the Community Region designation is in reality an urban sprawl growth zone. The Community Region (CR) designation is an open invitation for developers to propose future General Plan Amendments for "highest intensity of self-

sustaining compact urban-type development or suburban type development projects" anywhere in a CR. By definition such projects are inconsistent with existing General Plan land use designations and current zoning in those areas. Because the specific location and scale of these potential high density development projects were not identified in the 2004 General Plan EIR, the environmental impacts were not then and are not now meaningfully evaluated. LUPPU/TGPA/ZOU heightens these potential impacts by increasing the densities allowed in mixed use and residential districts and eliminating policies restricting growth on hillside slopes and requiring set-asides of open space.

The CR urban growth zone policy is oddly advanced as a means of protecting El Dorado County's rural quality of life. Those making this argument apparently favor sacrificing the existing rural character of all the communities within the CRs on the altar of protecting more remote areas for exclusive agricultural and forest production, in part by eliminating ag buffer areas for existing ag uses in the CRs. In this view, development is an uncontrollable force that unless harnessed within the CRs will inevitably disburse throughout the County, degrading its rural character and economy. In fact, development is highly dependent on infrastructure that puts housing within reasonable distance and travel time from employment centers. The notion that people seeking suburban commuter havens will instead choose remote rural corners of the County for their habitations is absurd. The markets for those seeking rural living opportunities (which includes many if not most current residents of CR areas) and for those who desire high density urban and suburban residences are entirely distinct. The fact that the County is giving serious consideration to several large scale urban development project proposals that are outside the CRs (e.g. Marble Valley and Lime Rock) instead of preemptively denying them as it clearly has the power and legal authority to do, should be a clue that CRs are not a credible restraint on development of rural areas in any event.

Instead of intensive high density urban and suburban development all along the Highway 50 corridor, the initiative to re-designate existing rural communities as Rural Centers with surrounding platted-lands overlays under the General Plan classification scheme is in keeping with the expectations of the current residents who chose those communities for their rural quality of life. Medium and low-density residential zones are not allowed in Rural Centers or in Rural Regions under the General Plan – hence the use of platted lands to retain consistency with the General Plan, as was pointed out in a white paper prepared by Roger Trout in June of 2013. Reducing the development potential of these large areas of the County now classified as CRs to that allowed under current land use designations and zoning will preserve the predominantly rural character of the County that will benefit everyone who lives in, travels through or visits El Dorado County. The measure will help protect the scenic quality of the Highway 50 corridor from becoming an uninterrupted vista of urban sprawl akin to Rancho

Cordova and Elk Grove. Creating less intensive, more open areas between urbanized areas of El Dorado Hills, Cameron Park, Placerville and South Lake Tahoe, provides breathing room and relief from the stresses of urban life. A continual vista of urban sprawl and the highway congestion that will inevitably accompany it will deter tourism to El Dorado County's wineries and orchard and many mountain recreational opportunities.

The objective of the Community Region amendment initiative is to advance an entirely different vision for the future of El Dorado County than is inherent in the 2004 General Plan and LUPPU/TGPA/ZOU. It calls for a change of direction that the voters should be free to choose, without interference from the bureaucrats with a built-in pro-development bias, and the monied special interests that benefit from development.

LUPPU/TGPA/ZOU depends for its implementation on the imposition of Traffic Impact Mitigation (TIM) fees to pay for road improvements needed to mitigate road congestion that would result from large areas of high density development in the Community Regions. The TIM fees are determined by estimating the cost of all road improvements that may be required for full build out of all anticipated projects in the County's Capital Improvement Plan within a 20-year planning period. Full developer funding of the necessary road improvements only occurs if and when all anticipated projects included in the CIP analysis are built out. This predisposes, if not mandates, that all anticipated developments included in the CIP analysis will be approved so that all road improvement in the plan will be funded. In the interim, TIM fees only fund "paper roads," and traffic impacts go unmitigated indefinitely. If additional projects are proposed that haven't been anticipated or planned for as made possible by the Community Region urban growth zone policy, the CIP and TIM fees will be inadequate to mitigate the impacts, and will have to be revised upward. Like other forms of Ponzi schemes, only early actors get a good deal. The rest suffer when the speculative house of cards collapses.

Similarly, the required water and sewer infrastructure to support high density urban development is to be provided by El Dorado Irrigation District (EID). EID is free to finance this infrastructure by rate-payer backed bonds, with repayment of hundreds of millions of dollars of advance construction costs to be made from hook-up fees -- but only when and if all of the anticipated development actually occurs. If, as in the recent Great Recession, development activity stalls or fails to materialize, the existing rate-payers are left holding the bag of massive debt. This method of financing is another way that pro-development bias is built into the County's official political culture. Periods of prolonged drought, such as we are currently experiencing, mean that all of the expensive infrastructure currently being planned by EIR will be unable to deliver water that simply isn't there, regardless of whatever paper

entitlements that EID may hold. Neither EID or the County have ever fully analyzed the effects of the drought on the development potential anticipated in the General Plan. Reducing that development potential seems the most prudent means of protecting the limited supply for current users.

Paradoxically, fee-based financing for massive infrastructure needed to support high density urban development makes affordable housing development of existing developable parcels economically infeasible. Small scale low intensity development by locally-based custom builders and craftspersons – once a significant local economic engine and local job generator– has been eviscerated by high fees that aren't justified by the more limited impacts of building out existing parcels that might otherwise be developed as of right. Planning for massive new subdivision development with infrastructure paid for through development impact fees has the unintended consequence of throttling less impactful development that supports locally-based jobs – something a more insightful General Plan would take care to support and encourage.

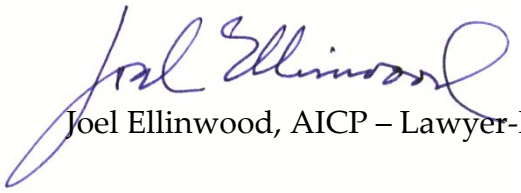
There are financing options for public infrastructure that don't create incentives for officials to continually approve all development proposals in order to generate sufficient development fees. If developers of major projects are required to build at least the initial phases of major infrastructure projects oversized for other reasonably foreseeable development, they are entitled to be reimbursed through fees charges to subsequent developments. This approach is more likely to result in more-efficient "right-sized" improvements, rather than projects conceived by some engineer operating without prudent fiscal restraint based on speculative projections of future growth. The creation of Mello-Roos financing districts, that spread the cost of infrastructure improvements over much longer periods than fully funding projects through impact fees all due and payable when permits are issued, is another financing option that creates more affordable means and lower initial housing cost of entry to the market. While these financing options are not favored by the development interests, they have been successfully employed throughout California and deserve thorough evaluation for use in El Dorado County.

The two citizen-sponsored initiatives that address road funding and the threshold of traffic-levels of service – effectively prohibiting the reliance upon "paper roads" for the illusion of traffic mitigation are responses to the County staff's continual efforts to undercut the original Measure Y adopted by the voters in 1998. Pausing large scale developments while a more responsible and prudent means of financing large scale road improvements can be worked out

is critical. Not allowing road segments and projects to be exempted from traffic mitigation requirement through the fiat of 4/5 of the Board of Supervisors is necessary if adequate roads are ever to be provided.

The Alternatives document reiterates at length a range of alternatives that were considered and rejected in the 2004 General Plan EIR – a document that was neatly insulated from legal scrutiny because adoption of the General Plan was put before the voters by the Board of Supervisors as an initiative. LUPPU/TGPA/ZOU will not be so privileged. The alternatives analysis presented relies primarily upon conclusory rationalizations rather than fact-based analysis. It is unsubstantiated opinion unsupported by substantial evidence in the EIR document and a chain of reasoning that links facts to a supportable conclusion. The selection of alternatives is politically motivated, rather than a good faith effort to independently identify reasonable alternatives that can be more objectively and meaningfully evaluated. These are flaws that warrant a substantial revision and recirculation of the EIR.

Very truly yours,



Joel Ellinwood, AICP – Lawyer-Planner

Cc: Shingle Springs Community Alliance
No San Stino

281040

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: DIER Comments Received (Sue Taylor)

1 message

Anne Novotny <anne.novotny@edcgov.us> Wed, Jul 23, 2014 at 8:31 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

------- Forwarded message -------
From: <sue-taylor@comcast.net>
Date: Wed, Jul 23, 2014 at 4:40 AM
Subject: DIER Comments Received
To: derek.reddin@edcgov.us, anne.novotny@edcgov.us

Data from form "TGPA-ZOU Draft EIR Public Comment Form" was received on 7/23/2014 4:40:41 AM.

Long Range Planning (LRP) Web Page Feedback

Field	Value
First Name	Sue
Last Name	Taylor
Address	P. O. Box 961
City	Camino
State	CA
Zip Code	95709
Organization / Agency	
Email	sue-taylor@comcast.net
Primary Interest	Both
	Major issues of the Land Use Policy Programmatic Update process: The county continues to call this process a 5 year General Plan Update required by the State rather than admit that this a complete overhaul of the County's zoning codes and General Plan. 20 plus General Plan amendments is not a simple General Plan Update. The need for this complete overhaul has never been clearly defined for the public. The entire process has been ill conceived, tainted and improperly handled from the beginning. To begin, the changes to the general plan to be implemented was crafted by individuals that will benefit personally from these changes. Rather than proceeding through the Planning Commission, as would be the proper channels, the Land Use Policy Programmatic Update (LUPPU) was vetted, without notices or agendas through a non-brown act extension of the El Dorado County Economic Development Committee (EDAC), the newly formed regulatory reform so called "ad hoc" committee. The

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Comments	presentation and items brought forward originated from a group of developer – lobbyists. Then after they presented to many organizations it was brought through the County "process". Little if any changes were made to the original presentation. The Board of Supervisors has basically stood by the sidelines taking direction from this group of lobbyists, the CAO's office and the Planning Department. If the public complained about the process or what was being put into the agenda, they were ignored, or dismissed or told that they were late to the table and why where were they when this all started? In fact I was told that if I did not come to the table then I needed to get out of the room. One time I was threatened by a member of the Reg Reform committee just for talking to a group of people at a Board Meeting. Another time I was threatened at a candidates meeting by the Director of the El Dorado County Economic Development Committee merely for letting the public know that this high jacking of our General Plan was taking place and being implemented by a group of developers. These so called "Ad Hoc" meetings took place every Friday morning from 8:00 a.m. to noon in a conference room of the county, staffed with at least one Planner and usually an Administrator. These meetings usually were only discussions of decisions that had already been made. While I was at an Agricultural Commission meeting, during the meeting, the Chairwoman of the Economic Development Advisory Committee made an announcement that Reg Reform would be meeting with a group from Pollock Pines to determine the community's desire for their future. No agenda was provided for this meeting. I came at 8:00 a.m. and asked if I could share a short 3 minute power point presentation about what the Board of Supervisors had already decided regarding the community region line in Pollock Pines. I was told that that meeting would not take place until 10:00 a.m. and I was given the impression I could share it at that time. When it came time for this part of the meeting they had us move to the Planning Commission room. More staff showed up along with a large group from Pollock Pines that had been invited along with 2 County Board of Supervisors. It became evident that this was by invitation only. If I had not heard the announcement made at the Agricultural Commission meeting, there would have not been any opportunity for myself or the public to know about the purpose of this future meeting. I was not allowed to share my power point and finally had to stand up in order to make a statement during the meeting. At the next Board of Supervisors meeting I brought this up, but no action was taken to remedy the behind door process the Reg Reform committee had established to vet the implementation of LUPPU. Reg Reform became more of a problem with other members of the public complaining that this long standing committee was not functioning under the brown act. Much discussion was had and it was stated by Reg Reform members, many times, that having direct interaction with staff without interference of the public was a much more efficient way for them to get things done. More people started to complain to the Board of Supervisors regarding Reg Reform and the Brown Act. This issue was finally agenized by the Board of Supervisors and County Council stated that Reg Reform as organized should be functioning as a Brown Act committee. This was also explained by County Council to EDAC. Members of EDAC disagreed with this and Reg Reform continued to meet without agendas. By this point the resolutions for LUPPU and a quick so called public outreach for implementation had already been completed. The public outreach was confusing, poorly noticed or

attended. Kim Kerr, hired as the Asst. Chief Administrative Officer, who was not qualified to facilitate these meetings, often mislead the public as to the purpose of LUPPU. She stated that the County was implementing LUPPU because it was mandated by the state due to SB375. By the last public meeting in Cameron Park, I challenged Kim Kerr on her lie and she admitted that that statement was not true. Kim Kerr has a Grand jury report from the City of Ione stating that she mislead the Ione City Council and was not qualified for her position as City Manager. Her actions caused financial damage to the City of Ione. This misconduct was brought before the Board of Supervisors several times and they continue to ignore the issue. All this is brought to light in order to explain how this entire overhaul of El Dorado County's General Plan has moved through the process from the beginning. At one Board meeting I asked the Board of Supervisors at what time would they be publicly discussing any of the huge issues contained in LUPPU. It was stated by Supervisor Veerkamp that AFTER public comment and AFTER the public hearings, the Board would then engage. So basically AFTER the opportunities for the public to be involved are over, they will then finally let us know their thoughts on the proposed General Plan Amendments and entire rewrite of the Zoning Ordinance. It is still unclear what the purpose is for this major change to the County's General Plan and Zoning Ordinance and what benefit will be had or why those implementing this change wish to impose such an environmental impact to the county. It is also unclear as to who has driven this project in the first place. Obviously not this current Board of Supervisors. This has been anything BUT an open process. The growth pattern changes were made by a developer-lobby group and then the county hired employees that would enforce the changes to be basically shoved through the system. To correctly implement the current 2004 General Plan, each element and policy should have been vetted individually in a matter that was clear and transparent to the public. The implementation process should have proceeded through the Planning Commission. County personal started in this matter, then were stopped in their tracks. The process was high jacked by a special interest group of developer lobbyists. Then rather than simply implementing the 2004 voter approved General Plan, a major overhauling of the General Plan and new zoning ordinance has been written. This is a conflict with the current General Plan's Purpose and Objectives. The only way to fix this is to start over and do it right. Rather than the Board of Supervisors allowing this to have gone through a tainted and corrupted system, they need to bring it back through the proper channels starting with the Planning Commission.

Email "DIER Comments Received" originally sent to derek.reddin@edcgov.us; anne.novotny@edcgov.us from sue-taylor@comcast.net on 7/23/2014 4:40:41 AM.

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281041

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: DIER Comments Received (Web Form - Shelley Wiley)

1 message

Anne Novotny <anne.novotny@edcgov.us> Wed, Jul 23, 2014 at 6:40 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

Anne Novotny
Senior Planner

County of El Dorado
Community Development Agency
Long Range Planning Division
2850 Fairlane Court
Placerville, CA 95667
(530) 621-5931 / (530) 642-0508
anne.novotny@edcgov.us

---------- Forwarded message ----------
From: <swiley@directcon.net>
Date: Wed, Jul 23, 2014 at 2:01 PM
Subject: DIER Comments Received
To: derek.reddin@edcgov.us, anne.novotny@edcgov.us

Data from form "TGPA-ZOU Draft EIR Public Comment Form" was received on 7/23/2014 2:01:14 PM.

Long Range Planning (LRP) Web Page Feedback

Field	Value
First Name	Shelley
Last Name	Wiley
Address	PO Box 3859
City	Shingle Springs
State	CA
Zip Code	95682
Organization / Agency	
Email	swiley@directcon.net
Primary Interest	Both

281041

Comments	To Shawna Purvines, Senior Planner Re: Public Comment on LUPPU/ZOU Draft EIR 7/22/2014 El Dorado County TGPA/ZOU Draft EIR comments The draft EIR addressing the changes being proposed to the General Plan and Zoning Ordinance cannot fully address the impact of the Zoning Ordinance changes because the full scope of the zoning change is not identified and/or not reasonably accessible. In my effort to find a mark-up version of our existing zoning map I have met with a county planner and they have agreed to begin the process of creating a mark-up version to facilitate a better understanding of the changes to the zoning map. Everyone agrees this will be valuable information; however it is too late to be of use for the dEIR. It is my understanding that there are 8,000+ parcels directly affected. I also believe it's a safe assumption that as few as 24,000 parcels are indirectly affected. Many of these parcels are in central portions of the county and will affect surrounding uses and landowners. This is not addressed in the draft EIR. Zoning was unilaterally updated to meet the Land Use Requirements without considering updating Land Use to reflect current Zoning. The current Zoning map more accurately reflects existing conditions which is the appropriate baseline to determine impacts to be addressed in the EIR. Without clearly defining the existing conditions there is no way to analyze the potential impacts. I attended the July 10th 2014, presentation on the Draft Environmental Impact Report for the Targeted General Plan Amendment and Zoning Ordinance Update and was impressed by the broad brush assumptions made within the analysis. This approach along with the lack of detail and access to changes within the zoning map creates the potential for lack of understanding of the scope of changes and potential for mistakes. In addition to the lack of understanding for the purpose of completing an accurate EIR, it also creates a transparency issue with the residents of this county that have been losing confidence in our local governments commitment to have an inclusive process. Currently there is no other reasonable way to determine the existing vs proposed zoning. NOP public comments addressed the same issue and the problem still exists. E.g.; comment 100053, 100069, 110007 I feel the county is buying into an EIR that doesn't even define the full scope of the project let alone address all potential impacts. Recommendation; Create a mark-up Zoning Map that accurately reflects the changes. Quantify this parcel changes in a matrix and address impacts. Thank you for your hard work, Sincerely, Shelley Wiley

Email "DIER Comments Received" originally sent to derek.reddin@edcgov.us; anne.novotny@edcgov.us from swiley@directcon.net on 7/23/2014 2:01:14 PM.

281042

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: DEIR Comments Received (Teddy McGraw)

1 message

Anne Novotny <anne.novotny@edcgov.us> Thu, Jul 24, 2014 at 8:20 PM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

---------- Forwarded message ----------
From: <tnbmcgraw@msn.com>
Date: Thu, Jul 24, 2014 at 12:24 PM
Subject: DIER Comments Received
To: derek.reddin@edcgov.us, anne.novotny@edcgov.us

Data from form "TGPA-ZOU Draft EIR Public Comment Form" was received on 7/24/2014 12:24:48 PM.

Long Range Planning (LRP) Web Page Feedback

Field	Value
First Name	Teddy
Last Name	McGraw
Address	1777 E Moonshroud Dr
City	Oro Valley,
State	AZ
Zip Code	85737
Organization / Agency	
Email	tnbmcgraw@msn.com
Primary Interest	TGPA
Comments	As General Partner of the Detmold LP , I would like to make two requests: (1) that the boundary line for the CR designation for our parcel 07025005 be changed so that the western boundary line of parcel 07028036 be continued North through our property. (2) This would also adjust the property line of 07025015. It seems only fair that if all the properties South of us are designated CR, our property should also be so designated.

Email "DIER Comments Received" originally sent to derek.reddin@edcgov.us; anne.novotny@edcgov.us from tnbmcgraw @msn.com on 7/24/2014 12:24:48 PM.

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Any retransmission, dissemination or other use of the information by persons other than the intended recipient or entity is prohibited.

If you receive this e-mail in error please contact the sender by return e-mail and delete the material from your system.

Thank you.

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TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Fwd: Subject: Comment on TGPA-ZOU DEIR

1 message

Shawna Purvines <shawna.purvines@edcgov.us> Tue, Jul 22, 2014 at 8:21 AM
To: TGPA-ZOU ZOU <TGPA-ZOU@edcgov.us>

-------- Forwarded message --------
From: **Dejan Obradovic** <dejan@adriaticbuilders.com>
Date: Tue, Jul 22, 2014 at 8:12 AM
Subject: Subject: Comment on TGPA-ZOU DEIR
To: shawna.purvines@edcgov.us, bosone@edcgov.us, bostwo@edcgov.us, bosthree@edcgov.us, bosfour@edcgov.us, bosfive@edcgov.us, edc.cob@edcgov.us

Dear Ms. Purvines,

As a member of the general public in El Dorado County, I expect the Draft Environmental Impact Report (DEIR) on the county's Targeted General Plan Amendments and Zoning Ordinance Update (TGPA-ZOU) be clear and concise. Not only do I expect that from a DEIR, it is required by the California Environmental Quality Act (CEQA) law so that I can make informed decisions about its impact to my quality of life. It is unrealistic for the county to expect that this huge, 1,212-page, vaguely-written document has helped me understand the impacts of the proposed TGPA-ZOU. The DEIR does not clearly identify the tens of thousands of parcels that will be impacted by the TGPA-ZOU.

I am requesting that you ensure that the Final EIR will have clear and concise data and analysis so that I can understand how I will be directly and indirectly affected by the impacts of the TGPA-ZOU.

Thank you,

Dejan Obradovic

2636 Gold Trail

Placerville, CA 95667

ADRIATIC BUILDERS & SOLAR CONTRACTORS

251050

LIC.# 929060 C-46, B

Dejan Obradovic (Sacramento & Tahoe Area)

510-384-5536

dejan@adriaticbuilders.com

Zeljko Obradovic (SF Bay Area)

510-332-1377

zeljko@adriaticbuilders.com

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Shawna L. Purvines
Principal Planner

County of El Dorado
Community Development Agency
Long Range Planning
2850 Fairlane Court
Placerville, CA 95667
Phone:(530) 621-5362/Fax: (530) 642-0508
shawna.purvines@edcgov.us
www.edcgov.us

251060

TGPA-ZOU ZOU <tgpa-zou@edcgov.us>

Comment on LUPPU TGPA-Z OU Draft EIR

1 message

Joel Ellinwood <jellinwood49@gmail.com> Wed, Jul 23, 2014 at 3:50 PM
To: TGPA-ZOU@edcgov.us, Lori Parlin <info@shinglespringscommunityalliance.com>, Frank Verdin! <nosanstino@yahoo.com>

Please find my letter attached.

Joel Ellinwood, AICP LEED AP
Attorney at Law

JE - LUPPU Alternative Analysis Comment Letter 7-23-14.pdf
114K

Joel Ellinwood, AICP LEED-AP
Lawyer-Planner

4054 New York Avenue, #1906
Fair Oaks, California 95628
(916) 436-9854
joel.ellinwood@lawyer-planner.com

California land use & environmental law; urban and regional planning policy & advocacy for a more just and sustainable future

July 23, 2014

Shawna Purvines, Senior Planner
County of El Dorado
2850 Fairlane Court
Placerville, CA 95667

Re: Comment on Draft EIR Alternatives Analysis for LUPPU/TGPA/ZOU

Dear Ms. Purvines:

Under the guise of a purported CEQA alternatives analysis, the paid County consultants – under the supervision of County staff – prepared a preemptive and partisan political polemic against the citizen-sponsored initiative measures slated for the ballot in the November 4 general election. The authors appropriate the initiatives sponsored by Rural Communities United, Shingle Springs Community Alliance, Residents for Positive Planning, and Save Our County and put them forward as "project alternatives" under a false premise – that they are intended as alternative means of achieving the same objectives as the Land Use Programmatic Policy Update/Targeted General Plan Amendment/Zoning Ordinance Update Project ("LUPPU/TGPA/ZOU"). This is a highly questionable, if not illegal use of public funds. At the very least, it exposes the pro-development bias of the planning department and CAO office and its inability to provide an objective, fair-minded analysis of the initiative measures.

In fact, the objectives of the initiative measures and LUPPU/TGPA/ZOA are nearly diametrically opposed. The conclusion that the initiatives are not preferred or feasible alternatives because they don't achieve what LUPPU/TGPA/ZOU is intended to achieve is a tautology, not analysis. This is the rhetorical equivalent of asserting that oranges taste bad because they are not apples.

LUPPU/TGPA/ZOU reinforces and intensifies a policy program of unrestrained and unanalyzed high-density urban and suburban development within the "Community Regions" arrayed along Highway 50 from El Dorado Hills to Pollock Pines. Although defined in the 2004 General Plan as an "urban limit line," the Community Region designation is in reality an urban sprawl growth zone. The Community Region (CR) designation is an open invitation for developers to propose future General Plan Amendments for "highest intensity of self-

sustaining compact urban-type development or suburban type development projects" anywhere in a CR. By definition such projects are inconsistent with existing General Plan land use designations and current zoning in those areas. Because the specific location and scale of these potential high density development projects were not identified in the 2004 General Plan EIR, the environmental impacts were not then and are not now meaningfully evaluated. LUPPU/TGPA/ZOU heightens these potential impacts by increasing the densities allowed in mixed use and residential districts and eliminating policies restricting growth on hillside slopes and requiring set-asides of open space.

The CR urban growth zone policy is oddly advanced as a means of protecting El Dorado County's rural quality of life. Those making this argument apparently favor sacrificing the existing rural character of all the communities within the CRs on the altar of protecting more remote areas for exclusive agricultural and forest production, in part by eliminating ag buffer areas for existing ag uses in the CRs. In this view, development is an uncontrollable force that unless harnessed within the CRs will inevitably disburse throughout the County, degrading its rural character and economy. In fact, development is highly dependent on infrastructure that puts housing within reasonable distance and travel time from employment centers. The notion that people seeking suburban commuter havens will instead choose remote rural corners of the County for their habitations is absurd. The markets for those seeking rural living opportunities (which includes many if not most current residents of CR areas) and for those who desire high density urban and suburban residences are entirely distinct. The fact that the County is giving serious consideration to several large scale urban development project proposals that are outside the CRs (e.g. Marble Valley and Lime Rock) instead of preemptively denying them as it clearly has the power and legal authority to do, should be a clue that CRs are not a credible restraint on development of rural areas in any event.

Instead of intensive high density urban and suburban development all along the Highway 50 corridor, the initiative to re-designate existing rural communities as Rural Centers with surrounding platted-lands overlays under the General Plan classification scheme is in keeping with the expectations of the current residents who chose those communities for their rural quality of life. Medium and low-density residential zones are not allowed in Rural Centers or in Rural Regions under the General Plan – hence the use of platted lands to retain consistency with the General Plan, as was pointed out in a white paper prepared by Roger Trout in June of 2013. Reducing the development potential of these large areas of the County now classified as CRs to that allowed under current land use designations and zoning will preserve the predominantly rural character of the County that will benefit everyone who lives in, travels through or visits El Dorado County. The measure will help protect the scenic quality of the Highway 50 corridor from becoming an uninterrupted vista of urban sprawl akin to Rancho

Cordova and Elk Grove. Creating less intensive, more open areas between urbanized areas of El Dorado Hills, Cameron Park, Placerville and South Lake Tahoe, provides breathing room and relief from the stresses of urban life. A continual vista of urban sprawl and the highway congestion that will inevitably accompany it will deter tourism to El Dorado County's wineries and orchard and many mountain recreational opportunities.

The objective of the Community Region amendment initiative is to advance an entirely different vision for the future of El Dorado County than is inherent in the 2004 General Plan and LUPPU/TGPA/ZOU. It calls for a change of direction that the voters should be free to choose, without interference from the bureaucrats with a built-in pro-development bias, and the monied special interests that benefit from development.

LUPPU/TGPA/ZOU depends for its implementation on the imposition of Traffic Impact Mitigation (TIM) fees to pay for road improvements needed to mitigate road congestion that would result from large areas of high density development in the Community Regions. The TIM fees are determined by estimating the cost of all road improvements that may be required for full build out of all anticipated projects in the County's Capital Improvement Plan within a 20-year planning period. Full developer funding of the necessary road improvements only occurs if and when all anticipated projects included in the CIP analysis are built out. This predisposes, if not mandates, that all anticipated developments included in the CIP analysis will be approved so that all road improvement in the plan will be funded. In the interim, TIM fees only fund "paper roads," and traffic impacts go unmitigated indefinitely. If additional projects are proposed that haven't been anticipated or planned for as made possible by the Community Region urban growth zone policy, the CIP and TIM fees will be inadequate to mitigate the impacts, and will have to be revised upward. Like other forms of Ponzi schemes, only early actors get a good deal. The rest suffer when the speculative house of cards collapses.

Similarly, the required water and sewer infrastructure to support high density urban development is to be provided by El Dorado Irrigation District (EID). EID is free to finance this infrastructure by rate-payer backed bonds, with repayment of hundreds of millions of dollars of advance construction costs to be made from hook-up fees -- but only when and if all of the anticipated development actually occurs. If, as in the recent Great Recession, development activity stalls or fails to materialize, the existing rate-payers are left holding the bag of massive debt. This method of financing is another way that pro-development bias is built into the County's official political culture. Periods of prolonged drought, such as we are currently experiencing, mean that all of the expensive infrastructure currently being planned by EIR will be unable to deliver water that simply isn't there, regardless of whatever paper

entitlements that EID may hold. Neither EID or the County have ever fully analyzed the effects of the drought on the development potential anticipated in the General Plan. Reducing that development potential seems the most prudent means of protecting the limited supply for current users.

Paradoxically, fee-based financing for massive infrastructure needed to support high density urban development makes affordable housing development of existing developable parcels economically infeasible. Small scale low intensity development by locally-based custom builders and craftspersons – once a significant local economic engine and local job generator– has been eviscerated by high fees that aren't justified by the more limited impacts of building out existing parcels that might otherwise be developed as of right. Planning for massive new subdivision development with infrastructure paid for through development impact fees has the unintended consequence of throttling less impactful development that supports locally-based jobs – something a more insightful General Plan would take care to support and encourage.

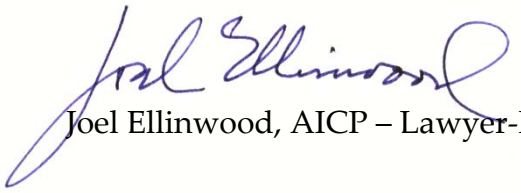
There are financing options for public infrastructure that don't create incentives for officials to continually approve all development proposals in order to generate sufficient development fees. If developers of major projects are required to build at least the initial phases of major infrastructure projects oversized for other reasonably foreseeable development, they are entitled to be reimbursed through fees charges to subsequent developments. This approach is more likely to result in more-efficient "right-sized" improvements, rather than projects conceived by some engineer operating without prudent fiscal restraint based on speculative projections of future growth. The creation of Mello-Roos financing districts, that spread the cost of infrastructure improvements over much longer periods than fully funding projects through impact fees all due and payable when permits are issued, is another financing option that creates more affordable means and lower initial housing cost of entry to the market. While these financing options are not favored by the development interests, they have been successfully employed throughout California and deserve thorough evaluation for use in El Dorado County.

The two citizen-sponsored initiatives that address road funding and the threshold of traffic-levels of service – effectively prohibiting the reliance upon "paper roads" for the illusion of traffic mitigation are responses to the County staff's continual efforts to undercut the original Measure Y adopted by the voters in 1998. Pausing large scale developments while a more responsible and prudent means of financing large scale road improvements can be worked out

is critical. Not allowing road segments and projects to be exempted from traffic mitigation requirement through the fiat of 4/5 of the Board of Supervisors is necessary if adequate roads are ever to be provided.

The Alternatives document reiterates at length a range of alternatives that were considered and rejected in the 2004 General Plan EIR – a document that was neatly insulated from legal scrutiny because adoption of the General Plan was put before the voters by the Board of Supervisors as an initiative. LUPPU/TGPA/ZOU will not be so privileged. The alternatives analysis presented relies primarily upon conclusory rationalizations rather than fact-based analysis. It is unsubstantiated opinion unsupported by substantial evidence in the EIR document and a chain of reasoning that links facts to a supportable conclusion. The selection of alternatives is politically motivated, rather than a good faith effort to independently identify reasonable alternatives that can be more objectively and meaningfully evaluated. These are flaws that warrant a substantial revision and recirculation of the EIR.

Very truly yours,



Joel Ellinwood, AICP – Lawyer-Planner

Cc: Shingle Springs Community Alliance
No San Stino

251068

Cindy Johnson <cynthia.johnson@edcgov.us>

Fwd: ZOU and OHV use

Shawna Purvines <shawna.purvines@edcgov.us> Mon, Aug 4, 2014 at 8:01 PM
To: Cindy Johnson <cynthia.johnson@edcgov.us>

Please add as Public Comment to PC agenda item for TGPA-ZOU.

Thanks
Shawna

---------- Forwarded message ----------
From: Brenda Bailey <brenda.bailey@edcgov.us>
Date: Mon, Aug 4, 2014 at 4:49 PM
Subject: Fwd: ZOU and OHV use
To: Shawna Purvines <shawna.purvines@edcgov.us>

Constituent comments regarding ZOU and draft Section 17.40.210

Not sure if you received directly.

Brenda Bailey
Assistant to Supervisor Briggs
(530) 621-6513

---------- Forwarded message ----------
From: Rob & Glo Vernon <robandglovernon@gmail.com>
Date: Sun, Aug 3, 2014 at 1:12 PM
Subject: RE: ZOU and OHV use
To: brenda.bailey@edcgov.us, bosfour@edcgov.us

Dear BOS and Planning Commission,

We live on Thompson Hill Rd in Dist.4. For as long as we've lived here, since 1993, the residents of 776 Cold Springs Rd, the Winjes, have maintained a moto-cross track on their property. The noise and dust generated by such activity has been a neighborhood annoyance for years. Within the last year, the situation there reached an intolerable level. For it was not just the residents, most of whom are elderly, but their kids, grandkids, and their friends who were using the facility. We are talking about a half-dozen sport bikes, with "sport" exhausts shrieking, tearing all over their property and making one hell of a racket and throwing up dust all over the place.

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The thing is, this area has grown in population over the last 50 years. Communities are getting denser. Even rural ones. In any case, people need to be able to live together in peace and with respect of others.

However, this has not been the case with the residents at 776 Cold Springs Rd. They regularly thumb their noses at the neighborhood and the County, believing that they can "do any damn thing they want". Now, I am not adverse to anyone doing as they like on their own property, so long as it doesn't interfere with MY right to enjoy MY property in peace and quiet. And there lies the problem.

These people are disturbing the whole neighborhood with their motorcycles and their hot-rods.

I am not talking about the occasional "run-about". I am talking about activity that lasts ALL DAY LONG. I have documented where they have been at it from Friday thru Monday, every day, all day, almost every weekend, in one month. Imagine having someone rev a half dozen chain-saws outside your window for hours at a time. It's extraordinarily annoying.

Now, I believe there are ordinances on the books that cover noise issues and dust issues. But so far, the response I get from the Sheriff's department is lackluster at best or outright indifference.

That is why I've brought this issue to the Supervisor's office. WE NEED SOME REDRESS!!!

NOW I hear that there is an update to the Zoning Ordinances to address issues such as this that would give us protection against such activity, but that the proposed language would actually ALLOW this OHV activity on "existing properties"?! This is absurd! There are facilities for recreational OHV activity in Cool and at Prairie City. OHVs such as the ones in question have no business being in a rural neighborhood! Especially when there are more than just the residents in participation. I understand that no one wants to "limit" what anyone can do on their own land, but when does that right eclipse

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the rights of others? I would like to see a "sunset" clause.

Now, how about guns? (uh oh, now he's getting really scary…..we don't want to rankle the NRA!)

We've got some people out here who like to shoot. Fine. They have facilities for that, too. But apparently, County law allows for such activity, in neighborhoods like this, as long as it is no closer than 500ft to any residence. 500 FEET? Seriously? 500 YARDS would make more sense. Ya know, people have dogs and horses out here, and for the most part, the dogs and horses don't like gunfire, either! Ever see a dog or horse freak out over gunfire? It's really, really sad. I would like to see THIS addressed in the ZOU as well.

Sincerely,

Rob & Gloria Vernon

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