REMEDIAL PROJECT MANAGERS' MEETING

NASA/JET PROPULSION LABORATORY

7 June 2001

ATTENDEES:

Eric Aronson, CH2MHILL

Kimberly Gates, Navy/NASA

Marvin Hillstrom, Navy Southwest Division
(via telephone)

Hooshang H. Nezafati, CH2MHILL

Mark Ripperda, USA EPA

Peter Robles, Jr., NASA

Leticia Woodward, JPL

Richard J. Zuromski, Jr. NAVY/NASA

Reported by: Louise K. Mizota, CSR 2818

Pasadena, California
June 7, 2001

ARONSON: -- out of here obviously
(UNINTELLIGIBLE) production wells and the sources in the sense of water we might be able to efficiently handle a fluctuating water table. And with that is -- you know, obviously, when water levels change significantly in modeling and -- it's more of a numerical type issue where you'll have calibration rather convergence issues, due to water tables that rise and fall considerably within your model.
The other issue is when you're citing production from wells and you're looking at the different layers, if some of those layers go dry, you have issues with whether or not it reassigns that water appropriately and does things like that.
So that's generally termed dynamic allocation of water, and it's a nice feature, but not presently in a lot of models but it is used in modeling. The Burbank operable unit, that was a consideration in their model selection criteria. They looked at these types of things and (UNINTELLIGIBLE) in their decision or at least their recommendation on that that was pretty heavily

looked at.
RIPPERDA: Let's just take a break for a second.
ARONSON: Sure.
(Reporter arrived.)
(Discussion held outside the record.)
(9:44 a.m.)
ARONSON: One of the issues, just to talk a little bit more about the specific demands of the JPL site, is obviously -- is issues when you have a lot -- large number of production wells, you have an irregular geometry, one of the things is looking at the issue of finite element versus finite difference in which one would be preferable or, you know, best helps us meet the needs and represent the site efficiently without adding a whole lot of elements here and a lot of grid blocks. And this just sort of illustrates that point a little bit.
Here you have a site where you have a, you know, say, a production well located in the middle, you want finer detail, greater degree of resolution out there. But that type of thing carries through to the boundaries and ends up with a lot more overhead with your elements and you get poor anisotropy at the edge. Finite elements, conversely -- I actually had the opportunity to

really grade those specifically around the area we're looking at. So when you have a lot of production wells, you can get the detail around each of those without suffering, making decisions, well, your model is going to be too big or we're going to have too many elements further out, and trade-offs like that.
Similarly to that, you have the opportunity in finite element to precisely locate your wells. We have some tight spacing with our monitoring wells and production wells out there. You know, you have another production well a little farther away. Then you have this same type of situation here. You're really going to start running into problems and it's very difficult to precisely locate the wells.
Finite elements, you can go through between these mode locations you can build right into the model and have that flexibility to represent that.
Now, finite differences generally, it's a little bit -- considered a conceptually simple approach by some people probably because Mod Flow has been around for a long time and has a well-developed interface. A lot of people are more comfortable with that. You kind of look at it full -- you know, in detail. The American one might

be a little more simple, but once you're comfortable with finite elements, it's really -- can be a more robust approach, depending on your particular problem.
Then all these things basically lend themselves -- any type of model we want to be able to develop the model efficiently, be able to import information, export information, be able to analyze that efficiently. It assists in, you know, expediting the calibration of the model.
ROBLES: Hold on for a second.
ARONSON: Sure.
(Discussion held outside the record.)
ARONSON: So I think in a couple slides we'll go right into looking at some of the features and some of the things.
Obviously, one of the other considerations is being able to efficiently develop the model, being able to import and export data quickly for being able to communicate on the back end and being able to display results, but also, more importantly, for the calibration process. Speeding that up gives you an opportunity to spend a little bit more time on working on the calibration as well.
And another important consideration is

that, you know, we will be able to export the information and import the information but be able to display it efficiently and in other types of software.

So basically, starting out the model evaluation, we identified a large number of programs. And basically, the initial screening is just identifying those that can handle pretty much the flow and transport. Paring that down, applying those criteria and a significant number of other criteria that were discussed in the workplan, but I didn't necessarily present, we pared that value down, or the number of possible codes, down to three. And those were CFEST, ModFlow and FEFLOW.

Basically, we took the opportunity at that point to look at each of these in a little bit more detail, spend a little bit of time. We did some sample problems, test problems so we could compare sort of the more qualitative things like efficiency, the speed at which these things, particularly the accuracy and the ability for it to converge with our dynamic conditions of the JPL site.

Based on going through that process, it really -- the best alternative, and it was fairly clear for our particular, you know, geometry and

local site conditions was FEFLOW. FEFLOW is a finite element, flow and transport. It actually has a lot -- a great deal of additional options as well, and it's a very sophisticated code.

So I'm going to go into at this point and show you guys a little bit of what FEFLOW looks like and just show you the state of where the model is, just a real light overview of several -- couple things that went into designing it, kind of introducing you to the idea, and then we'll look at a couple examples of the post-processing, just go through some real quick details on that.

ZUROMSKI: We're going to call in another person too, at this point.

ARONSON: Okay.

RIPPERDA: So who wrote FEFLOW?

ARONSON: FEFLOW was developed by (UNINTELLIGIBLE). It's actually an East German company. It was developed beginning early in the late '70s, but it wasn't really until the opening up of East Germany that it became more widespread in its use. Now it's very popular in Europe and it's increasingly -- more increasingly, or ever increasingly more popular in the United States as well. But it is -- its introduction here is a bit

younger.

RIPPERDA: So has CH2MHILL been using it for a while?

ARONSON: This is probably the second project we're really using it on right now. We did do quite a bit up front making sure we check out things very thoroughly, did a lot of communication with the national labs and other places that have used it, particularly for the Livermore site, which is a Superfund site in California that uses FEFLOW, I guess formerly used CFEST in 1998, replaced that with FEFLOW. And some of the other national labs, Pacific Northwestern National Labs, communications with them and stuff like that, in addition to, obviously, obtaining it and doing a lot with it.

(Telephone dialed.)

(Discussion held outside the record.)

ZUROMSKI: This is Marvin Hillstrom from the Navy Southwest Division. He's unable (UNINTELLIGIBLE).

Hi, Marvin. It's Richard Zuromski.

HILLSTROM: Hi, Richard.

ZUROMSKI: You're on the speaker phone now.

HILLSTROM: Okay.

ZUROMSKI: Okay.

HILLSTROM: This is Marvin Hillstrom, Southwest Division at the Navy.

ROBLES: Okay.

ZUROMSKI: Okay. So I guess at this point you guys want to go through and do the modeling, the presentation of the modeling.

ARONSON: Yeah.

ZUROMSKI: You're not going to be able to see a lot, Marvin, but --

HILLSTROM: No, I realize that.

ZUROMSKI: But we'll narrate as we go along.

HILLSTROM: I won't be able to see anything, actually.

ZUROMSKI: Right.

RIPPERDA: Maybe just a few questions before you go on this.

NEZAFATI: Absolutely.

RIPPERDA: So you're handling the free water table. Can you handle storage in the vadose zone? Do you have -- if the water table declines, do you track the moisture content?

ARONSON: Capillary fringe?

RIPPERDA: Yeah.

ARONSON: Yeah. We're just simulating the saturated portion of the model so there is not the

unsaturated vadose zone in these simulations.
RIPPERDA: I don't know how much water will be coming down over several months, but, you know, there must be some amount of water that --
ARONSON: Right. Generally, with all these -- any type of saturated flow code or when you're simulating a saturated portion of flow which is almost nearly, you know, a vast majority of the cases is you're looking at the delay between when it leaves the ground surface and the time it reaches the water table. And you're looking at, you know, accounting for that delay in the application. You know, obviously, there's a time delay between when precipitation falls on the ground and reaches the water table. That's always something that's built in to. So you do apply all that water. You don't lose that water. You do lose, you know, just a minuscule amount, you know, capillary fringe going up and down. When you have coarser sediments out here, you know, you don't have clays that are holding the top -- lot of water.
RIPPERDA: Drainage is pretty fast.
ARONSON: Right.
RIPPERDA: I wasn't worried so much about precipitation in the immediate areas. Just, you

12

know, the water table fluctuates rather rapidly by 10, 20 feet.
ARONSON: Right.
NEZAFATI: At least in the shallow end.
RIPPERDA: Yeah. And with your dynamic allocation, so when a zone goes dry in a well --
ARONSON: Uh-huh.
RIPPERDA: -- does the model just take whatever percent was coming from that and assign it to the others, or do you have some kind of well bore model that integrates with the model itself to reassign it based on --
ARONSON: That's essentially -- it's looking at the interval over which, you know, the production is applied and it's looking at the relative transmissivities of those units that are drawing the water. So, you know, if it was a real permeable unit that starts to go dry, obviously more pump production that was coming out of that is distributed.
But at each step it's dynamically looking at what are the high gradients, what's the height of the water table and it's allocating the water based on, you know, those zones which have the ability to take on more water or less water.

13

RIPPERDA: Okay.
NEZAFATI: One thing I might add about your first question, how to handle the vadose zone and unsaturated, maybe, flow, this code actually not only handles saturated flow, but also has this unsaturated component to it. That not so many codes they have this. They have separate codes for unsaturated flow, as you know. And we think that we're going to be using that. It's going to be come in handy when you look at distributing this water from the spreading basins to the groundwater because, as you know, we have about 200 feet or so of the vadose zone and the water doesn't just flow right away.
RIPPERDA: Right.
NEZAFATI: It really creates a mounding, if you will, which is responsible to some great deal to this rather local reversal -- reversal of the flow direction that we were seeing, you know, in some of the contour maps that have been put together in the RI.
RIPPERDA: So rather than just applying a source to those nodes --
NEZAFATI: We're going to be trying to see if we can simulate it as an unsaturated, you know, flow

14

and then distribute that as reasonably as we can to feed into the groundwater.
RIPPERDA: So in the solution matrix is that all -- is it completely integrated, or do you have like a separate 1-D model that then determines what the source would be so you have a parallel?
ARONSON: Yeah. It's initially basically -- we'll look at the distribution and determine sort of what would happen. But we were going to do that in sort of the preprocessing stuff, in two-dimensional looking at that. And then once we get an idea of that delay that I was trying to describe and, you know -- you know, how -- roughly how much is applied up here, but the time of how much -- maybe it reaches here a month later, a month and a half later and the volumes are going to be, you know, somewhat shifted. So we can look at that to try to draw some conclusions to begin with so that we can apply it when it hits the water table, appropriately. If you ran the whole simulation, if you had the option of doing a full saturated and unsaturated --
RIPPERDA: But if you ran a couple --
ARONSON: It would run -- you know, you would be solving that. It would be highly nonlinear. It would take an incredible amount of time.

15

NEZAFATI: Yes. Exactly.

ROBLES: Hooshang, when you said "flow reversals," what do you mean by that?

NEZAFATI: What I meant was that you have a mounding in the, basically, groundwater because of the spreading basins. You're dumping a lot of water. So the water has to go through the vadose zone to reach to the groundwater, but it doesn't quite dissipate, depending on the make-up, texture of the vadose zone and the rate that's being applied and what area it's being applied to. So it becomes like a mound at -- initially, at least, but then it dissipates, basically, gradually.

So that mounding may be -- and again, this is a local scale. Nothing really to -- beyond, basically, those spreading basins, that you may see, basically, the direction of the groundwater flow in reverse of what you would expect. But this is, basically, until this sort of mounding is dissipating and the feeding into the groundwater. But it's local. It's not extensive and you cannot imply -- or we can talk about that in more detail, but that's what I meant. Just a local, basically, reversal because of the spreading basins.

RIPPERDA: Oh, darn.

GATES: You want it to go uphill?

RIPPERDA: That's -- not that we don't know what flow reversal is, but the size of a flow reversal is --

NEZAFATI: Yeah. I know that it's a sensitive issue, but we can talk about it in more detail.

ROBLES: I wanted it on the record so we can --

NEZAFATI: Exactly.

ROBLES: See, we use flow reversal. We all understand it, but when people read the transcripts, there is this view of the whole Raymond Basin flowing and they have to understand there's localized effects --

NEZAFATI: It's localized effect.

ROBLES: -- and regional effects.

Okay. Go on, Eric.

ARONSON: One of the tools we're using, kind of go back and forth with FEFLOW, and one of the things that's important when we're looking at any models is, you know, obviously GIS is a really powerful tool and it allows us to have a great deal of different information, to look at, visualize it, you know, spatially against each other or on top of each other. So like most of ModFlow pre-processors, post-processors and FEFLOW have the opportunity to

bring in GIS data very easily, relate that information, assign properties based on doing that type of thing.

What I'm showing you here, basically, the yellow is sort of the outline of -- the yellow is basically an outline of the -- let's see if it will refresh real quickly and -- let me shut this down real quick and open it back up.

ZUROMSKI: Eric, is all of this on your computer right now? You're not linked into the -- your server at the site. So that's why it would be --

NEZAFATI: Delays. Takes a little longer.

ARONSON: Yeah. It was actually up just a couple minutes ago. So I don't know particularly what happened.

Here it's back and it's -- everything is there.

Just basically, the yellow outline is sort of the extent of the alluvium as mapped by DWR. But you could see here -- and I also -- what I am showing is a base map or a photo base map underneath the site. Kind of going in a little tighter, the black line represents the extent of the model domain. As you can see, it doesn't extend out along the edges, does not extend out towards, necessarily,

the edge of alluvium.

What we have there is basically bedrock is rising fairly steeply along, you know, obviously the sides you can see out here. At that point, looking at the water table, basically the water table intersects bedrock at that point. These areas off to the side are not saturated alluvium. It's important within the model, obviously, that we're representing the saturated zone, and that's what we're modeling.

ZUROMSKI: Can you overlay the extent of the ModFlow model on that as well?

ARONSON: Yeah. That's the extent of the ModFlow model that was previously done. Like, one of the things -- features you can see in this contours of bedrock, this is a topographic high of the crystalline bedrock, the underlying surface bedrock. And here it's called Monk Hill. Basically, there's a significant rise where it actually intersects the water table and creates an area where, you know, flow does not come through here. It obviously goes around because it's in contact with the bedrock.

Also shown on here are the locations of the production wells and the dense monitoring well network for the JPL site.

So basically, we've created some of these contours of the different layers for the different units within the model. And being able to prepare our information and, you know, visualize that and determine the extent of the model, we can go ahead and bring that into FEFLOW, basically.

What I'm showing you here against the base map or the background map is actually the transportation. It's roads, freeways.

Here's the mesh that was developed for the JPL groundwater model. You see it's much more dense in the area particularly around locations of all the production wells where we can build those specifically right into the mesh.

Here's downgradient production wells. This particular location is the upgradient injection and production wells that are located up here, the La Canada Irrigation District wells and the Valley wells.

And then basically, this is sort of -- the finer detail generally represents the area which -- we're interested in much finer detail and ultimately being able to simulate transport. We want to have finer detail within that area.

20

I'm just going to really quickly show you a three-dimensional view of this model, give you a couple interesting things, I think. One of the things is currently -- showing right here is the top of the map. One of the things you can see looking at this, you can see, obviously, the four layers coming through the model and the extent of those within the model. You can also get a kind of a feel for sort of the slope out there.

Now, this is a little tilted, but you can see that down in the JPL area, down in this kind of a lower area, bedrock actually -- or the ground surface actually slopes downward towards the site from both the east and the west directions. Direction of groundwater flow along this east side is basically sort of along this outer boundary and straight down. But it gives you a good feel for the surface topography out there.

And you can do all sorts of things with your model results in the back end of looking at things and including, you know, looking inside your model. I'm getting lost in things like that. I'll just go ahead and exit that right now. Backed up way too far.

Just to kind of show you, right now we're

21

in the process of calibrating the model, but to introduce some of the other aspects or features of the model, just a real brief introduction, just kind of look at this example or demonstration problem. Basically, a situation where you have a couple downgradient production wells in the area and a couple sources, a waste disposal pit and a seepage pond. And basically, one of the wells was experiencing impacts due to contaminants.

And basically, this was a FEFLOW model that -- flow, transport and also used particle tracking to quickly analyze that. So looking at that model in FEFLOW, we can go ahead and exit out of this one.

Now, it's a little difficult to see just because a laptop isn't the best way to house FEFLOW onto a larger monitor, so you have to really scroll around, but it's much more efficient done in different -- or a larger screen.

GATES: Now, is this the German example that you showed us before?

ARONSON: Yeah.

GATES: Located in Germany?

ARONSON: Yeah. There's basically a lake in the southern portion of the site down here. There's

22

bedrock up along the northern portion and there's a river along the eastern boundary.

Here's looking at that model within FEFLOW. We'll go ahead and quickly look at some results that I ran so we can get an idea of some of the particle tracking and just look at a little bit of the solute transport as well.

This is a transient model run for 20 years. Basically, they looked at the source areas, made some assumptions about the strength and the size of those sources and then did some forward simulations to try to determine whether or not -- which of these sites, or if at all, these sites were the ones that would be impacting the downgradient production wells.

So what we'll do quickly is, first of all, we'll just look at a little particle tracking. Particle tracking. We can basically do forward particle tracking where we can try to drop that in and look at that in the forward direction and see, you know, what's reaching the wells.

We can also look at this backwards, looking basically at the capture zone of that water, delineate, sort of, the area, you know, under these particular conditions that are contributing water to

23

the well.

Now, the forward particle tracking -- go ahead and just set a couple options. It doesn't save the options, actually.

Quickly go ahead and do some forward particle tracking, basically releasing particles upgradient and watching where those particles end up, kind of getting a feel for where particular sources of water under these particular conditions end up. You can see what gets captured by the well. Sort of a quicker effort for looking backwards in time, wanted to see what contributes to that well is we can do multiple paths around a single well and we can just go through and very quickly select a particular well and look backward in time.

Actually, since I'm in a shallow layer right now, backward in time makes me pop up right at the surface, of course.

Let me go ahead and do a deeper layer. Basically, I just moved down to a layer that's probably about midway through where the actual well's located. You can do this for each of the different layers to look at where particles are starting at that particular elevation and up.

We'll go ahead and -- and we could do that

for both wells and kind of get a picture of where particles starting, going backward in time, end up capturing water that's contributed to that.

RIPPERDA: How about if you looked at someplace that wasn't a well?

ARONSON: We can do that as well. Right now I happen to be -- I set the option to do from a well, where it releases all sorts of points. You can set an option to do backward and then set up a line and just release points along the line or delineate a polygon and release points along a polygon or the edge of a plume. Say if you want to look at everything starting above 5 M -- or no -- above the MCL. You can set a set of particles around that level, the plume or the interpretive plume, and let that go forward in time and see where those end up.

ROBLES: What are you thinking, Mark?

RIPPERDA: Oh. I was just asking a question.

NEZAFATI: The answer is yes.

ROBLES: We think it's a good tool for us to look, you know, because one of the things is we want to make sure that where we put any treatment well, that we capture as much of the plume as possible.

ARONSON: Sure.

Just real quickly, there's -- also, we can

look at this particle tracking in three dimensions and kind of get an idea of that, which is a pretty, I guess, really interesting option. But right now we got kind of the map overlaying that. Let me go ahead and turn off the map again.

We could go ahead and do -- start multiple path lines along -- around a well, go in, basically do the same type of thing we just did a second ago. I'm going to select that. Then you can actually look at it in three dimensions and get an idea of, you know, vertically its movement throughout there.

Now, I started about 100 particles around the well at that particular elevation, so it's not quite as clear as if you had one or two, but it gives you sort of the ensemble idea of what's connected to there. You can also export all this information, you know, by what particular elevation it's in and display it in other types of software, overlay it with base maps. And you can also display the base maps in here.

And then just real quickly going into (UNINTELLIGIBLE) solute transport in the forward -- or at any particular time. You can do that pretty quickly by -- we'll look at it at time 20 and see what that happens to be. Basically, you get an idea

of what the plume looks like. See on the legend basically the source areas are set at about 500 milligrams per liter and you're looking at what happens to be impacting the well in these various concentrations.

And you can export all this types of information as well. Just going back to Arc View, we can turn on -- here is that plume at 20 years. We could also overlay it with the capture zone and get a feel for that. You get the options of also, you know, looking at the plume at other times and kind of getting a feel for its movement through time. And all this types of information can also be exported for, you know, animation or kind of look at it sequentially as it moves for particular, you know, scenarios.

So that's a little bit of an introduction just -- sort of into some of the tools that were selected particularly for this and where we're at in developing the JPL groundwater model.

Any questions or --

ZUROMSKI: Seeing --

RIPPERDA: Looks good.

ROBLES: What do you think, Mark?

RIPPERDA: Looks perfectly suitable.

ROBLES: Okay.
ZUROMSKI: I think once we get the calibrations completed and they've calibrated the model and we get our actual -- our data into our model, it will show, obviously, a lot more than just the simulations that -- for demonstrations.
NEZAFATI: Yeah, exactly.
ROBLES: We want to give the RPMs a presentation of that and take your comments on it because this has got to be, as we said before, this is the long pole in the tent for the EE/CA, that we need to look at this so that we can justify our alternatives and present that so that way it passes public scrutiny.
RIPPERDA: Uh-huh.
GATES: So everybody gets to go to Santa Ana, then.
ROBLES: Sure. Everybody can go to Santa Ana.
GATES: Can you load the model on that?
ARONSON: Yeah.
GATES: I didn't think you could. You could?
ARONSON: Yeah. Ultimately, yeah, I can move everything over. This is probably just a little less powerful and it's --
GATES: Right.
ARONSON: -- not as easy to display stuff.

GATES: That's what I was thinking.
ARONSON: But yeah. Definitely.
ZUROMSKI: So whether we have -- when we do have the model complete, whether we do it in Santa Ana or here, we'll have to -- we'll make that choice at the time. Right?
NEZAFATI: Yeah. We've been looking forward to that opportunity.
And, Mark, we have close to a dozen professionals that are assisting us on this project. So -- and we'll be able to give you a full presentation of the different aspects of the technical work we are doing, including the progress that we have made on the model. So we're looking forward to that, and we're inviting you to come and visit us in Santa Ana.
RIPPERDA: So a dozen professionals. Does that mean Eric is an amateur?
NEZAFATI: No. No. Including. Including. Well, he is a very good professional.
ROBLES: Mark, I wanted to ask you just what did you think about -- you know, we expanded the area of the ModFlow for FEFLOW, because we felt that we needed to get into the major areas and other issues that this could be used at in the future. We thought that, you know, first case is that expanding was a little too much, but then talking with Eric, that it seemed to be the best thing is to look at the alluvial soil, saturated soil because that's what we have to model all the way through.
ARONSON: One of the really interesting is -- upgradient, basically, there's a flow divide between the Verdugo Basin and the Raymond Basin. Basically, the bedrock rises and then it slopes back down on the other side. That represents, really, a strong boundary of -- a strong physiographic boundary for a model boundary. It involves a stronger level of detail. I think it's much easier to justify and, you know, have a better feel for where the water is coming from rather than having a boundary located a little farther down.
RIPPERDA: No. That makes sense.
ZUROMSKI: And part of our discussions with the City that you participated in is expanding the model downgradient, the boundary, so that we can help -- assist them in finding locations for additional production wells in the future as well. And the area that we had was originally -- would be more limited, so we could possibly expand the boundary as part of that work. So there's lots of reasons for

expanding the boundary.
RIPPERDA: So, then, underneath the fourth layer or where lower layers pinch out, you have either the second or first layer sitting on bedrock, those are all no-flow boundaries, right, underneath?
ARONSON: Correct.
RIPPERDA: And all around the edges, the northern edge and of that southwestern edge.
ARONSON: Southwest. Along here?
RIPPERDA: Yeah.
ARONSON: Yeah. These are all bedrock interfaces, basically, along here and along here.
ZUROMSKI: The yellow is the Raymond Basin boundary. Correct?
ARONSON: Yeah. That's basically the edge of alluvium for the Raymond Basin. It extends up to -- the Raymond Basin extends up in the mountains. As far as -- talking about like the Raymond Basin as described for Regional Water Quality or State Water Quality Control, you know, divides it up and includes the mountains as well with the actual basins.
RIPPERDA: So at various points there where there is recharge coming down from washes, you don't have no-flow boundaries. Right?

ARONSON: Right. It's part of the water budget that's being developed or has been developed. And then looking at that is addressing sources of water through drainages and how that contributes along, like the Arroyo Seco in this area particularly. Surface water, there's really not -- most -- the surface water bodies are aligned with the exception of, basically, the Arroyo Seco through this local area just north of Devil's Gate Dam.
RIPPERDA: And how about inflow from the northwest?
ARONSON: Basically, looking at the contours of water levels and actually the elevations of bedrock, water levels kind of, obviously, go up and down in time, but they range basically between here and here. There's portions that indicate that the water levels at the very edge of the basin, and this has been found in other studies as well, are unsaturated.
Basically, this being a topographic high, water that falls in these areas runs this way and runs this way, sort of, at that point. And there's not enough sustained water in this, you know, little area coming in that's going to make this anything more than nominally saturated significantly through

there. So that is a no-flow boundary between a flow divide.
RIPPERDA: So what's the inflow to the whole -- you know, to everything northwest of here?
ARONSON: Source of the water up here, basically? The sources of the water include precipitation, natural recharge that falls basically on the alluvium and drains into there, which is deep percolation from natural recharge. We actually have irrigation recharge, or applied waters in this area.
And also, this area is -- a significant portion of this area is unsewered. They have -- do have an aggressive sewering program in the La Canada area, but they've only done a few or a smaller number of streets thus far, so there's return flows from sewage as well.
RIPPERDA: So what kind of data do you have on water balance, on water inflow rates up there? How are you going to assign that in your calibration runs?
ARONSON: Basically, we look at the entire water balance to begin with. Before you even get into modeling, we develop a water budget saying, you know, looking at the water levels and seeing how that's changed, are we seeing an increase in water

levels. Is there more water coming into this area than leaving, and looking at how much is leaving and balancing those things out and looking at what would account for the differences, where is the water coming from, identifying sources.
And there are volumes throughout. For things like applying recharge you look at land use. They look to see that, you know, how is the land being used to see, you know, if it's largely paved or industrial. Commercially, you're going to have significantly less recharge there versus residential. You can also for the -- after identifying the unsewered areas, you can look at sort of typical populations in those areas and draw some conclusions about water use. And there's definitely engineering background to developing estimates of those return flows and things like that.
RIPPERDA: And then are your downgradient boundaries constant head, constant pressure?
ARONSON: This boundary along here is a -- represents basically sort of a long-term flow line. Water coming down here basically kind of continuing in the Raymond Basin watermaster -- Raymond Basin Management Board contour maps plus some, you know,

information we've reviewed and compiled for creating contour maps outside the area. This is generally a flow line. We have -- flow line generally, as long as it's not influenced by the production well, represents a flow divide for -- you know, because water is flowing along that line and not crossing across that. That represents a good boundary.
Down here, this is actually a -- can be fixed flux or fixed head boundary along this area.
RIPPERDA: Are your calibration runs, are any of them going to -- how long are you going to run a calibration run for?
ARONSON: Basically, we're looking at a period from -- a flow period of data from 1995 to 2000 or right up to recent conditions, taking advantage of the most recent, you know, information. So that's sort of where we leave off on calibration. Obviously, we're set to run scenarios going forward.
RIPPERDA: Do you run any longer term ones that go for, you know, 100 years or so, without worrying about calibration per se, but just worried about reaching steady state?
ARONSON: Right.
NEZAFATI: In the future, you mean, for the -- evaluating the alternatives, to look into --

RIPPERDA: No. I mean actually going back to make sure --
NEZAFATI: Oh, going back.
RIPPERDA: -- what you have now will actually work in steady state. So you assume some kind of average input.
NEZAFATI: Exactly.
RIPPERDA: You've got your average output flux and you let it run for just, you know, 100 years to see that it doesn't flow up or that you don't get wildly high water levels at some point or --
ARONSON: Right.
NEZAFATI: Exactly.
ARONSON: That's actually sort of the initial phase of the calibration, sort of looking at that balance and making sure that, you know, it sustains a steady state run, that the balance -- amount of water that's coming in balances the amount of water coming out and appropriately assigned and you have the water budget well understood, you know, before then, then you can step in and take it to the next step of the calibration.
RIPPERDA: So you actually do run it for a long period of time?
NEZAFATI: Yes, we do. Actually, we're planning

to go back like in 1939 time frame and then using these average, basically, water levels and average flow conditions and running the model. And specifically looking at the plumes, the way that we see it now, at least it's been documented, see if the groundwater conditions, by that I mean flow and basically gradient and directions, are in tune or consistent with the plume maps that we have seen out there and then use that as a means of calibrating model for solute transport. So we're going to be doing that.
RIPPERDA: Good. I wasn't hearing that at all.
NEZAFATI: Yeah.
RIPPERDA: That's one of the things that I care the most about, is can you run it for 1,000 years and have it reasonably approximate the way it looks now?
NEZAFATI: As long as we have some ways and means of supporting that or comparing that with information that we have. I mean, that could be -- model is a nondestructive tool, so you can -- as you know, you can run it for, you know, extended periods of time.
ARONSON: As you go farther back in time, obviously, the data is considerably more limited in

the particular --
RIPPERDA: Right. 1,000 years is too big.
NEZAFATI: Yeah. Yeah.
RIPPERDA: But 100 years or so. It's like we used to run models for thousands of years just to make sure --
NEZAFATI: 10,000 for the Yucca Mountain. I know.
ARONSON: Of course, for those types of purposes. Yeah. And a lot of times when you're running it for a long, long transient you're just marching towards steady state. We're just getting to that, so you can look at what the steady state, sort of, result is. And we'll be doing steady state just as a check on the water budget looking at -- and locking in, you can lock in a lot of material properties to begin with during that initial phase.
ROBLES: Are the records in hieroglyphics that go back that far?
RIPPERDA: No. You just assign your water budget and it's obviously mass in equals mass out. You're not going to completely blow it up, but you make sure that at least in steady state --
ARONSON: Right.
RIPPERDA: -- it reasonably approximates realty

rather than --
ROBLES: That's a calibration method.
NEZAFATI: Yeah. I think you have to always think about uncertainty, what do you have as far as tangible data, you know, what do you have and how you can compare that with, basically, your model simulations. And then your accuracy is basically dependent on, really, what you have to compare your results to.
ROBLES: Now, Eric, do you feel more comfortable with FEFLOW than ModFlow?
ARONSON: I particularly definitely do, and particularly for this -- any type of -- well, when you have such a dynamic site and you're covering, you know, a decent amount of area you have all this discretization around these particular production wells and you're carrying that through the boundaries, you're going to resolve lot of overhead.
Also, this happens to be, I think, a really robust tool. ModFlow has been so well developed on the road and that's -- you know, contributes to its popularity, but there's a lot of great finite element methods out there. I spent a lot of time with finite elements and finite difference in the past. And for this particular, I

think, finite element does suit the problem better.

ROBLES: Okay.

ARONSON: And FEFLOW suits the problem better.

NEZAFATI: Did we answer your question on the groundwater budget? Did we answer that? Do you want me to elaborate a little more on that or --

RIPPERDA: No. I think since you're basically applying sources, but -- and then you've got a constant flow out. Obviously, if you have mass in equals mass out --

NEZAFATI: Exactly.

RIPPERDA: -- you're not going to go dry or you're not going to like have it like geyersing out. So that almost seems unfair, because obviously you can make it converge very readily by having constant flux both in the input and the output.

ARONSON: Well, yeah. On the output side of things you're looking at, you know, time-dependent values, looking at water levels rising and falling and those types of issues. I guess within a model you're always going to be assigning recharge and that's always going to be assigned as a flux and you're always going to be assigning all those types of things, you have to go in and out, because those -- some of the other real metered values

are -- you know, obviously groundwater production is measured at the meter and, you know, those are really well recorded values of what's being extracted there, and they also track what's being spread out here.

RIPPERDA: No input has to be a flux. You know, I don't have a problem with what you're doing. This looks like you guys are doing a great job.

ARONSON: The key is making sure that that downgradient boundary isn't driving this simulation and it's far enough away --

NEZAFATI: Exactly.

ARONSON: -- that it doesn't impact your results.

NEZAFATI: It's not impacting the results.

THE REPORTER: One at a time, please.

ARONSON: It could be a (UNINTELLIGIBLE) or a flux boundary. And, you know, you choose the same type of result. It's not going to be driving the simulation result, and that's an important consideration when locating that boundary.

ROBLES: Okay. That was Item 3.

ZUROMSKI: Actually, we're going to go back to the beginning of the whole presentation.

NEZAFATI: I was just going to suggest that I

start with mine --

ZUROMSKI: Sure.

NEZAFATI: -- while you're at it.

ROBLES: Before we start, let's introduce ourselves.

ZUROMSKI: We'll go back. We'll go back to the full beginning of the meeting, introduction.

NEZAFATI: Should I start? You want to start?

ROBLES: Peter Robles from NASA/JPL.

RIPPERDA: Mark Ripperda from U.S. EPA.

WOODWARD: Leticia Woodward with JPL.

NEZAFATI: Hooshang Nezafati with CH2MHILL.

ARONSON: Eric Aronson, CH2MHILL.

ZUROMSKI: Richard Zuromski with NASA and the Navy.

GATES: Kimberly Gates, NASA and Navy.

ZUROMSKI: And on the phone?

HILLSTROM: Marvin Hillstrom from Southwest Division, Navy.

ROBLES: Okay.

ZUROMSKI: Great.

ROBLES: Let's start with Item 1, which is Project Overview and Schedule. We had just finished Item 3, Modeling Demonstration.

So, Hooshang, why don't you go for it.

ZUROMSKI: Do you want to do the -- this is actually us as well.

ROBLES: Okay. Fine. Whatever.

ZUROMSKI: I just wanted to -- I think Hooshang is probably going to get into some of the items on the OU-1 and 3 schedule for the work we're doing with the EE/CA, the modeling and other work in OU-1 and 3.

But as an overall project overview I just wanted to talk quickly about some of the upcoming events that we're going to have. Some of them we'll get into more detail later on in the meeting today.

But, for example, for OU-2 right now, we have one more public meeting coming up on June 20th, and then during -- before June 20th and then, of course, 30 days after June 20th we'll be working on the responsiveness summary. And we will be submitting to the RPMs, including David and Richard, our initial draft of what we believe -- we've gotten probably, what, about 25 comments so far in the mail and the ones that we received at the public meeting, and we'll be responding to those and submitting them to you guys, make sure we all concur in the responses and then submitting that to the commission of record. So that's generally what's going on with

OU-2 and schedule.

And at this point in time it looks like, as far as scheduling purposes go, we should have a draft ROD and probably a draft workplan for expanding the pilot study sometime towards the end of July/August time frame to you guys for review. And that would put us to -- hopefully put us to a final ROD sometime towards November of this year. And that's for OU-2.

OU-1 and 3, we're looking at finalizing all the modeling that Hooshang just discussed by the end of August of this year, and at the same time in September of this year we're going to be looking at our internal draft EE/CA. And then sometime later, towards October time frame most likely, we'll be moving towards our draft EE/CA, which we'll be submitting to you again for review, to the RPMs for review.

And that is our general schedule for the main event that we're working on right now. And I think Hooshang is going to go into more detail on all the work that they're doing on OU-1 and 3 and some more specific time lines and things that they're working on. So hooshang --

NEZAFATI: Thanks. Maybe I should stand here.

ARONSON: Sure.

NEZAFATI: What I would like to do today is to give you a brief status report on the work that we are doing for the JPL site. As Eric mentioned, when we came on board on this project, we started with the main task of developing a groundwater model for the JPL site.

We reviewed the data, the site-specific data, the regional data, as well as the existing or previous modeling work, and then by consulting with NASA/JPL and identifying a set of specific objectives for the JPL site, we tried to, by reviewing the data, come up with a technical approach that how we're going to be developing a model which addresses those objectives.

As Eric mentioned, we prepared a groundwater modeling workplan, which basically summarized the technical approach that we developed to construct this groundwater model. And we used, basically, a rather new code called FEFLOW, as Eric mentioned, to construct a groundwater model for the JPL site. And this model, as Eric explained, it's both for flow and solute transport purposes.

The other major task that we are involved with is performing an engineering evaluation of

treatment technologies for the groundwater, focusing on VOCs and perchlorate in particular, and looking into both ex-situ and in-situ technologies.

We are also looking into evaluation of applicability of policies, such as the DHS' policy 97-005 and AB 26 -- Assembly Bill 2646 to Arroyo Well. This is, again, in relation to finding out whether -- what it's going to take us as far as regulatory requirements are concerned to potentially open or reactivate this Arroyo Well and put that back on line, or whether some other options needs to be looked at.

We also, as part of our technical work, we looked at -- we looked at basically updating the perchlorate trend analysis for Well 52. And again, as some of you might know, Well 52 is next in line to Arroyo Well. And then the concerns are that whether the -- how the perchlorate is impacting this well. And based on the previous information, a trend analysis was done.

And what we did was that we used the most recent information to update that trend analysis and then see that -- how the impact is being, basically, projected by the observed information that we have at this -- at this well.

We also looked at obtaining some additional data to support the ongoing work, and most -- particularly the groundwater modeling work, which I'm going to be talking about just a little bit more later on.

We're going to be also evaluating the ARARs for the site, and also we're going to be shortly starting on preparation of an engineering evaluation and cost estimate for the groundwater for the JPL site.

Now, this EE/CA, again, engineering evaluation and cost estimate, is sort of taking the center stage for this JPL site. And then it's going to be benefiting from the different pieces of the technical work that we're currently involved with. And to capture that essence, I have this sort of a diagram here that shows at the center we have the EE/CA and it shows how the different technical work they're going to be basically -- they're connected to one another and ultimately they're leading into supporting EE/CA for this site.

Starting with groundwater modeling, which is going to be benefiting from the additional data that I'm going to be describing that later, namely, large-scale pumping tests, as well as potentially collecting spinner-logging data from the City of Pasadena wells. And we're going to be developing alternatives for EE/CA, and the groundwater is going to be used to evaluate the effectiveness of those alternatives.

Parallel to that we're looking into treatment technologies for the groundwater and we're going to be putting together treatment trains to address the treatment of VOCs, perchlorate and the chemicals of concern in the groundwater. And that's going to be also leading to the EE/CA.

We also, parallel to that, we're looking at ARARs issues and at DHS policy 97-005 and AB 24 -- 2646, and then that's going to be also assisting or leading into EE/CA.

After EE/CA is prepared, then we're going to be basically summarizing the EE/CA results in this action memorandum or remedial action plan, and then identifying a selected remedy for the JPL site.

Now, on this additional data that we -- we actually looked at two major items. One was spinner-logging of local production wells, mostly City of Pasadena wells. And for the benefit of everybody, spinner-logging information gives us the kind of information that we need for -- not only for

groundwater modeling purposes that Eric talked about, but also for future production wells, installation of the production wells.

And what that tells us that basically how that flow -- what portion of that flow rate from a given production well is coming from what zone, if you will, within the aquifer that this production well is screened into. And by also taking water quality samples from the zones that we are testing this flow ratio, it also gives us indication that what is the quality of that water which is being pulled into that well from that particular zone.

And that information is useful for the modeling as we're talking about the dynamic sort of proportioning of the flow rate, because we have an aquifer that may have different zones and then -- and the production wells, from particularly the City of Pasadena production wells, they're screened along a longer, basically, thickness of this aquifer and they intercept different zones. And then the question is that if you have a 2,000 gpm flow rate from a given production well, what portion of that rate should be assigned to what unit. And that's basically the value of this information.

We have coordinated with NASA/JPL, the

Navy and then City of Pasadena. We have talked to vendors that they performed this type of testing, and we have put together, basically, a memorandum which summarizes our findings, that what is going to entail to get this test done, how much it's going to cost. And then we're presenting that to NASA/JPL for their consideration.

Now, second item, which is very important one, and I'll explain that, it's to perform, basically, a large-scale pumping test. We evaluated different options in order to perform this pumping test. And again, for the -- I'll just explain a little bit that these pumping tests are, as you know, very important to be able to test the hydraulic parameters of the aquifers that are being used for drinking water purposes, or for any other purposes, actually.

So by performing these tests, we can get the kind of specific parameters, hydraulic parameters that we need to calibrate the model, namely, hydraulic conductivity parameters, restorativity parameters, and also the ratio of -- the anistropy ratio, in other words, the horizontal hydraulic conductivity as compared to the vertical hydraulic conductivity of the aquifers.

Now, one of the comments that we had from regulatory agencies in the past was they also pointed out that the modeling work could benefit from performing, basically, larger scale pumping tests, and then we discussed this with NASA/JPL and the Navy, and we looked at, actually, three options. The option one was that to see if we can use the existing monitoring wells and multi-port wells at the JPL site to perform this test.

And just briefly, this test entails designing an extraction well and screening that at the specific zone within the aquifer that you're interested in getting those parameters, and then you need a bunch of observation wells screened in the same, basically, unit and located at different distances from the extraction well, that while you're pumping from this extraction well, you are also monitoring the response at these different observation wells.

So that's basically what it entails to design a pumping test. And then so you have bunch of wells that you have to design and install.

So the first option was to look at, well, can we use the existing monitoring wells and multi-port wells at the site.

Second option was that if they are not designed properly for aquifer testing, what's going to take to, basically, perform this test, how many wells, how many locations we have to do this -- perform this test and how much it's going to cost.

And third option was to be creative or at least to see that given the fact that you may have a very unique situation in this basin, how we can maximize using the available information on a much, much larger scale and then to be able to analyze the information and get the type of the parameters, hydraulic parameters that I just described.

And what we ended up doing was that since option one -- very quickly, we reviewed the existing, basically, monitoring wells and multi-port wells and determined that, for instance, multi-ports are not suited or designed for the pumping test and these observation -- or these shallow monitoring wells, they are not -- they're like located 300 feet apart so they're not -- they are too far away from the extraction to be used as observation wells. So that option was basically considered not feasible.

Option two was very costly because it involved putting in 12 or more extraction -- observation wells in different depths up to 600,

8 -- 700 feet, and it was quite costly. Half a million, you know, or more. So -- and then it was going to take six months to a year in order to even install these and get the information.

So what we ended up doing was basically -- let me just -- we learned about this opportunity that in this basin the production wells are being, basically, turned off momentarily for a few days in order to allow the Raymond Basin Management Board to do -- to perform the monitoring of the static water levels in the basin. And then they -- after they -- this monitoring is done, they turn, basically, these production wells on and then they're back into business.

So what we did was that we looked at, basically, the monitoring wells on site, including multi-port wells, and by reviewing the data, and by that what I mean is that how they respond to the pumping wells when the pumping wells are on? We basically picked up to 18 wells that we thought that those are the wells that they're sensitive enough to the pumping -- production wells by the City of Pasadena and also other purveyors. And then we came up with a plan, present it to NASA/JPL and the Navy's coordination and NASA's coordination, and

also their subcontractors, we basically helped them to implement this monitoring of the 18 wells.

So what we did was that -- these are, basically, the location of these wells. We have Well 52 and Ventura and Windsor well, and also a number of shallow monitoring wells, as well as multi-port wells like MW-4, MW-3, as you can see on this map. So these are the 18 wells that we sort of picked and then we helped -- assisted with the implementation of the monitoring of these wells.

Some of these wells were monitored continuously. Some of these wells were only monitored periodically, every two hours. And we -- when the pumps were shut down, we started basically monitoring to make sure that we get the ambient conditions, the static conditions. And then we were ready, when the pumps were turned on, to continue monitoring, basically, these monitoring wells and recorded the information. And we are currently evaluating that.

I have couple of slides here that shows basically the results for certain wells. For instance, here we're looking at MW-3. And the one with the light blue color, I guess that's a deeper screen. This is a multi-port well. And the pink

one is basically screen 2, the dark blue is screen 3, and the light blue is screen 4.

And as you -- and this is very consistent, this kind of response, from one monitoring well to another. As we are seeing is that the deeper screen is much, much more sensitive to the pumping. And as you can see, you are seeing a lot of drawdown at that particular well.

This graph, by the way, shows groundwater elevation versus time. And then you have the dates on the X axis and the groundwater elevation in feet in the cell on the vertical axis. And basically shows that through time how the elevation of the groundwater at that particular well is basically being impacted by this pumping.

The shallower screens, as you can see, they show some response, but they're not as sensitive or as large as the deeper screen that we have -- we were seeing for this well, as well as -- I have another well. This is MW-12. And again, this graph is similar, shows groundwater elevations versus date.

And then as you can see, the deeper port, in this case screen 5, shows much more response. Actually, 90 -- up to 90 feet of the drawdown.

And this basically indicates that you have a very high vertical gradient and then that may be I guess partially explaining why you have this contamination or the wells are being impacted by the chemicals in the groundwater because of the fact that you have a driving force, as it's indicated in these graphs.
Now, what we do with this information is that --
RIPPERDA: Can I ask you a few questions?
NEZAFATI: I'm sorry. Yes.
RIPPERDA: So what wells were pumping for this?
NEZAFATI: We had three wells pumping. This was Well 52, Ventura and Windsor and the City of Pasadena wells, and also Lincoln Avenue wells.
And again, there were some other wells far distance, you know, from the site, but we didn't -- by reviewing the data, we only focused on the -- on the, basically, production wells that are influencing these monitoring wells.
RIPPERDA: Right.
NEZAFATI: So really, the three on the City of Pasadena and the two on the Lincoln Avenue.
RIPPERDA: How about the La Canada wells a little bit upgradient?

NEZAFATI: I think that was also pumping and was turned off in this period, and then we have basically that information -- data reflect in that as well.
RIPPERDA: And were the wells -- the City of Pasadena wells and the Lincoln Avenue wells, you said you were working with them. Did they all turn their wells on at the same time? You got flow rates for all of them?
NEZAFATI: We have exact, basically, timing that they were turned on. They were practically turned on the same time, but there are some time lags between wells. But we have the charts and we have the exact, basically, timing that they were -- came on.
RIPPERDA: And they had been off for a few days?
NEZAFATI: Yeah. They were off for a few days. I have information here, as I go by. I was a little bit ahead of myself here. I was going to just say that this response shows thoroughly a three-dimensional groundwater flow exists and it's real.
We looked at four model layers that we are using in the -- basically, the model because eventually this information needs to be feeding into

the model. So we wanted to be consistent with the layers and figure out at which port in a given particular multi- basically, port well corresponds to the layer that we are going to be using in the model. And then we use this information to come up with 11 different aquifer parameters for four layers. And namely, you have four layers or four hydraulic conductivity values or transmissivity, four restorativity parameters, and also three ratios of horizontal to vertical, basically, hydraulic conductivity, using the midpoint, basically, distances between the adjacent layers.
So in other words, 18 wells are being used to give us this 11 different aquifer parameters.
ZUROMSKI: We're going to do this again in October as well.
RIPPERDA: And are you going to be able to run the spinner tests in all those wells that you -- that are --
GATES: No.
ZUROMSKI: Yeah. We're really going to do spinner tests. What the spinner logs involve, I don't know, Hooshang kind of got into it, they actually -- the wells have to be off and you do it at the production wells. And in order to do the

spinner tests you actually have to remove all the --
NEZAFATI: Wellhead.
ZUROMSKI: -- wellhead, put the equipment down in the well, put it back in and interrupt the production schedule. So currently the only well that is feasible from that standpoint is Arroyo, because it's always off. So we're coordinating with the City on that. But we'd also like to see if we could do that for maybe some of the currently producing wells. And whether we can do that or not is going to depend on if we can coordinate that with the City when they shut their wells down, because we don't want to have to interrupt their production schedule in order to do this.
So we're going to start with seeing -- right now, Hooshang -- we met with the City last on Monday, and we're getting a lot of data on the Arroyo Well and the other wells to see where the screens are. They've been resleeved and in -- recently, back in '69, so we're trying to get the data on where the new 20-inch sleeve is and the screens in the 20-inch sleeve are compared to the 26-inch screen that was in the original well because there may be some influences from the old screens to the new screens. So we don't want to do a spinner

test that might not show --
NEZAFATI: Exactly.
ZUROMSKI: -- what we're looking for. So we're evaluating that right now.
RIPPERDA: That was going to be a whole big question on spinner tests.
Are you actually going to do it in wells and will we be seeing -- and are the wells fully screened, or are they screened in intervals?
ZUROMSKI: They're in intervals. They're in intervals.
NEZAFATI: They're fully screened, but you have some blanks in between given the fact that you have some fine grain material and whatnot, and they've tried to basically maximize it, targeting the more coarser.
RIPPERDA: So when you're trying to evaluate this data, how are you going to assign production to the various steps?
NEZAFATI: The same way that basically the model is going to be -- the FEFLOW is doing.
I was just going to say that what we are using for this evaluation of this data, actually it's a separate computer model called MLPU. It's a Dutch model, multi-layer, basically pumping, for

pumping test purposes. So what it does that, it basically dynamically allocates, again, this flow rate between the different layers. But it's not close to the spinner-logging data that you can basically compare to. But based on the T values, transmissivity, the thickness of the layer and then initial K values that are being assumed to do the inverse modeling, it assigns proportions of flow rate to these different layers.
But it's basically something that computer model does this based on the transmissivities of the layers, not -- nothing compared to what you would get from the spinner testing, spinner-logging testing.
RIPPERDA: Do you at least know that the wells are fully screened over these different intervals?
NEZAFATI: We do have that information, yeah.
ZUROMSKI: Uh-huh.
NEZAFATI: We have all this well basic construction details from the City of Pasadena. They are documented in the RI and FS as well. Yes.
RIPPERDA: Okay.
NEZAFATI: So this computer model, basically, the way it works is that it takes the governing equations for the description of the flow in a

three-dimensional, basically, sense and then does it what we call inverse solution, which means that you have to give the model the location of these extraction wells, how much they are extracting and also the layers that -- we have four layers in this case. And then initially we have to assume hydraulic values or hydraulic parameters, hydraulic conductivity values, actually, and then run the model to see that what kind of drawdowns the model predicts at the given monitoring well that we have, basically, monitored this response from the real world.
And then depending how far the simulated drawdown is with respect to the actual or observed drawdown, then that tells you that -- how good your initial estimates are. So model allows you to go in an iterative way to come up with better estimates of the hydraulic conductivity at each step to close in and come up with simulated drawdowns that are very close to the observed ones at these, basically, monitoring wells.
And then at the end you have values that they are basically the best values to match the simulated water levels with the observed ones that we have in the monitoring wells.

This is kind of an inverse solution type approach. And the model, as I said, not only gives you the hydraulic conductivity values, storage coefficients, as well as the ratio of how the horizontal transmissivity or hydraulic conductivity is compared with the vertical one.
And we have done some preliminary evaluation of this. Like in this graph, the dotted -- the dots in three colors, blue, red and black, they're basically actual observed data from this MW-17, one of the multi-port wells, and the different three screens.
But this solid black line you see is -- this is a preliminary result. This is just maybe just initial runs that we did. And that shows how the model sees the real world.
So, as you can see, there is a difference between these dotted lines and then the solid line, and that only tells you that you're there, but you're not quite there, so you have to go back and then basically change these parameters in such a way that your simulated result, which is demonstrated by this dark line as well as -- or solid dark line and then solid blue and red line that you see at the top for the other two screen, how does that compare with

the observed -- the actual information that we have collected from these monitoring wells.

And then by going through this iteratively and then in every step we're getting closer to the values that they are, basically, we call it, best fit to the observation wells.

ZUROMSKI: 17 is off that map. It's near the Lincoln Avenue well site.

RIPPERDA: I was also wondering about 3 and 12.

ZUROMSKI: 3 is right in the middle of the Arroyo.

ROBLES: 3 is here, 12 is here and 17 is right here.

ZUROMSKI: And actually, if you look at that map that Hooshang showed earlier, you can kind of look.

RIPPERDA: All right.

ZUROMSKI: You can kind of tell where they are in location to each other.

NEZAFATI: This doesn't have the site map here, but Well 17 is here, and this is MW-4, MW-3, MW-1, Ventura, Windsor, Well 52 and Lincoln 5 and Lincoln 3. And basically, these are the other wells that we have.

ROBLES: You can see, Mark, 17 is -- here are the two Lincoln wells. Here is Arroyo. Here is 52.

And then here is 3, and 12 is right there. That gives you a good --

NEZAFATI: We think that this is as close as you can get to the real world. And this opportunity basically -- we realized that and discussed with NASA, it is really a very great opportunity that, you know, you have all these production wells and the monitoring wells and then you have this large basin, groundwater, basically, basin and then you have an opportunity to see that how, basically, the aquifer behaves and then using that, basically, information and reducing that to parameters that we're going to be using the model.

But also, we're going to use the model to actually, when the model is calibrated, to go back and test the model and see that how the model predicts -- the well model predicts these, basically, observation data that we have seen dealing with this pumping test.

And we are calling that pumping test, because what's a pumping test? Again, you have a bunch of production, extraction wells and observation wells, but nothing in this scale. I mean, this is really as large a scale as you can get and as real as you can get to a real world

situation. Because otherwise, as you know, you have to basically have some extraction wells and observation wells and you only, again, get, basically, to test only a portion, maybe a smaller portion of the aquifer as compared to what we have been able to test here, which is much larger, you know.

And then we're very, I guess, comfortable with this information and we think that this is -- we're going to be getting a lot out of this information in the future to calibrate the model and also adds a lot of credibility to the model results and makes the model results more defensible, because nobody can argue that, well, you know, there is no pumping test anymore, and then also the scale of the pumping test that we manage to perform at the site.

ZUROMSKI: Actually, Mark, if there's data that after we do this you see that -- you think that maybe we need to look at, we're going to do the same exact thing again in October when the Raymond Basin shuts down again. And we'll have all the same wells and everything ready to go.

If there's things that you think that we should look for that maybe when you see the results that we didn't, you know, please let us know and

we'll make sure that we look at them because we're going to have an opportunity to do this again and include it in the data that we're going to be submitting to you.

NEZAFATI: Actually, along the same lines, we're going to be documenting this, this whole exercise of, you know, monitoring and analysis and results and all the assumptions, and whatnot, in a technical memorandum. We're going to be presenting that to NASA/JPL and the Navy and regulatory agencies. And we encourage you, and we are very anxious to, obviously, gain some feedback and comments back from you. As Richard say, we could use that in the future events and make sure that we consider some of the concerns or questions that you might have in more detail.

So let me see.

ARONSON: That was me.

NEZAFATI: Oh, that's yours, then. So with that, I guess, if you have any questions.

I don't know if I answered your question regarding that other pumping wells that -- actually, the senior hydrogeologist that did this testing model was Fritz. He couldn't be here. But looks like that those wells -- La Canada, you said?

RIPPERDA: Yeah.
NEZAFATI: They may have been -- they are not included, it looks like, because I didn't see that in that map. And it could be that by analyzing the historical data we figure that they're not really influencing these monitoring wells.
RIPPERDA: That's why I wanted to see where your monitoring wells were, because La Canada is pretty far away.
NEZAFATI: Far away. Exactly.
ZUROMSKI: We have 13 here and 10 here, which were both part of the test. And I guess the only other ones that in the future that if we did want to see in the next test would be 6 and 14, we could probably look at to see if there was any influence from upgradient.
NEZAFATI: Exactly.
ZUROMSKI: We could also look at any influence when we know that they're injecting water as well, to see both extraction and injection --
NEZAFATI: Exactly.
ZUROMSKI: -- things that we could look at.
NEZAFATI: And obviously, we were also -- not limited, but we wanted to be cost effective and we didn't want to really, you know, monitor a bunch of,

you know, monitoring wells if we don't get the value -- the valuable data that we think we're going to be getting.
So what we have done -- it shouldn't be basically looked at as this was the only option or plan or number of monitoring wells that we could have monitored. But we did the best we could by going back to the historical data and then reviewing, basically, the periods within the year that these pumping production wells are very active and looking at these monitoring wells and time series of, basically, the water level measurements and then making an evaluation that, well, which wells are more sensitive and then using, basically, or picking those wells as the first phase of this investigation.
But we're very happy, actually, that we had this opportunity to collect this information, and then we think that we're going to be getting a lot of value out of this information for the modeling purposes and then down the road, I'm sure for other purposes as well.
ROBLES: Okay. Next. What else do we have?
ZUROMSKI: Do you have any other -- do you have any other questions here? Okay.

RIPPERDA: No.
ZUROMSKI: That's the general -- that's the big part of what we're working on at this point in time.
Agenda Item Number 2 is Operable Unit 2. I gave you some -- there's four bullets. And I gave you the first three dates earlier. Public meeting number three is going to be on the 20th of this month. And our responsiveness summary will be coming in after that, in July, and the draft ROD in August as well.
Pilot Study Operations. We currently just shut the pilot study down. We had asymptotic levels about a month ago and we were really drawing much more VOCs out of the ground at this point. So we shut down. And right now we're going around the site and looking at -- we have a lot -- there's a large monitoring network on this site and soil vapor wells that were originally monitored back when they did the RI that haven't been monitored for a while. So we're trying to look at which ones are available that we can monitor that still have a vacuum response to see for our expanded pilot study where we would place additional extraction wells in the future. So we're going around and looking at that right now to put that together and submit to you a

workplan for expanding the soil vapor extraction study. But that's ongoing. And like I said, hopefully by August time frame we'll have that plan submitted to you as well.
We did the modeling demonstration, which was Item Number 3.
And Item Number 4 is Pilot Studies. As I said, pilot study for SVE has been shut down right now, and we will be -- we'll be doing our regular monitoring of the soil vapor wells to see if the levels come back up and whether or not we're going to turn that well back on or where we're going to put other wells at this point.
The packed bed reactor pilot study that we're doing up in OU number 1 right now is shut down, and we are -- I was hoping that David would be here today because we're still having some issues with discharge of treated water from that system. And David was going to be talking with, I guess, the County Sanitation District to see if we could discharge the water from that system to the sanitation -- to the sanitary sewer. And, you know, unfortunately, David is not here today, so I don't know what the status of that is right now.
But we're shut down not only because of

that, but we're reconfiguring the reactors right now with some different packing materials and different -- and loading them with -- we found that one of the first results that we received from that test was that the JPL bacteria that we isolated from the aquifer here was the most successful in the reactors, and the other two were successful as well.

And one of the results from the test so far has been that the choice of the bacteria that you use initially really is not of great concern in these tests, because all of them seem to reduce perchlorate very, very effectively. So since we've eliminated that parameter from our test, we're now going to just focus on the packing materials and flow rates through the reactors, but using the JPL bacteria. So we're reconfiguring that right now while we're waiting for David's response as well, so it's kind of given us a chance to get all that together. And we'll be restarting that over the next few weeks as well.

And then the in-situ pilot study, we still are planning on doing that. Some of the things that we're dealing with right now are -- there's some conflicting data out there. In-situ degradation of perchlorate is fairly new, and one of the issues

that we're dealing with right now is what is the correct electron donor to add to the subsurface to stimulate the in-situ degradation of perchlorate by the bugs.

And from our initial microcosm tests, there were a suite of different donors that were going to work, the most effective being acetate. Some new data came out. There's a contractor that Arcadis, Geraghty & Miller, who has worked here before, has said that maybe molasses was a better one to use. But then there's some conflicting data with another new study that came out that said maybe molasses doesn't work.

So in selecting the right contractor and also the contractor who knows how to use the correct electron donor, we're trying to make sure that what we do inject into the ground is going to be effective in stimulating the bacteria.

So that's kind of where we are in evaluating that right now. But that is still planned for going ahead and doing that for source reduction up in -- towards the Monitoring Well 7 site. So we are going to do that. It's just a matter of make sure we select the correct donor, the correct contractor, and then also the adequate

delivery system and extraction system as well.

RIPPERDA: I forget. What are you using in the packed bed reactor?

ZUROMSKI: Packed bed reactor, the ones where we had the JPL isolate bugs we were using acetate, which we found was the most effective for the ones on site. And then in the -- another one we're using ethanol, which was similar to the U.S. Filter fluidized bed reactor because we're using a similar type of bacteria in there. So both acetate and ethanol.

The problem with the both of them is that they're both very expensive. So we're trying to find something a little more -- something that's less commercial, like molasses or lactate or things that would be a lot less expensive for a large scale type of system.

So though acetate is very effective, it's a lot more expensive. To try to see -- balance, you know, which ones work the best with cost considerations. Also, with molasses, there may be some issues with being able to actually deliver it into the aquifer and seeing what kind of radius of influence you can get. That's another issue as well. But the ones up there right now are

using -- the one we will be continuing will use acetate as the electron donor.

So that's the status of all our current pilot studies.

Item Number 5 is the EE/CA. Hooshang gave you a status on that for the most part. As you know, we're trying to do -- go through the non-time-critical removal process right now because it's going to be a lot quicker in getting to our results. And so we should have our -- we're going to be working on putting the data from the modeling.

They're currently working on their evaluation of the different technologies for ex-situ reduction of perchlorate. And all of that is being put together into the internal draft for EE/CA, which you'll be getting probably before the next RPM meeting. And then once we get our -- we look at it, take a look at it, we'll be submitting that to you shortly after. So that's the story on the EE/CA.

RIPPERDA: And the EE/CA is focusing only on a single extraction well and just to capture the plume. It's not looking at it --

ZUROMSKI: Right. Single or two, depending on -- right. The EE/CA will focus on capture of the plume and treatment of that groundwater on site and

then reinjection into the aquifer, and we'll focus on looking at possible replacement well for the Arroyo Well as part of that whole package. And that's, again, being put into the model.
We went -- on Monday we went and walked around the City of Pasadena. Folks -- the -- Brad Bowman and Gary Takara from the City, and we went around to the sites that they're proposing that they showed us on that map that one day. We went to each of the sites, looked at the sites, looked at what was there. Right now the -- two of the sites have wells, but the wells are no longer in use because of, I guess, a couple of the casings are cracked or crooked or broken. So we looked at what was available, what's currently there. We're also going to do some water level measurements at those sites and try to see -- evaluate those sites as potential sites as well.
So that's part of that, again, trying to all feed all of this into the EE/CA to get to our one common -- you know, to get to the action memorandum, which will say this is what we want to do with the -- for the removal action. So that's the EE/CA.
Item Number 6, and since you're the only

one here and you're the only one -- or actually, I guess David was there, too. I just was going to maybe really try to inform Richard and give everybody an update of, you know, we met with the City and what we -- basically what we discussed on replacing their well. But there's really -- that's really the only -- from that meeting the only things that have come out of that so far is that we have had subsequent meetings, two subsequent meetings with the City. One we had -- Peter and I had a conference call with them to discuss to make sure that we were moving on our action items.
And then again this Monday we had -- we're meeting every two weeks, whether that's on a conference call or a face-to-face meeting. And so this week on Monday we went out -- we went to their office and we did a pretty good data collection with them. Hooshang went with us because we wanted to make sure that we're getting all these well logs and production data from -- you know, history until the present. And then we went around to all the sites. We also looked at the Arroyo Well site for possible spinner-logging and for, you know, a possible site for our extraction well for the removal action. So that's what's going on with the City right now.

RIPPERDA: Have you been talking about money with the City?
ROBLES: We haven't discussed like the issues of compensation and so on. That has been the attorneys getting together.
RIPPERDA: Right.
ROBLES: What we've discussed is basically the engineering.
RIPPERDA: Right.
ROBLES: What we wanted to do was ask them what property would they be looking at for a replacement well location. We want to help them by doing a modeling to make sure that where it's decided to put a replacement well would be okay, because we don't want to trigger into another area or zone of contaminants.
The issue of the replacement well I think has been settled, more or less.
ZUROMSKI: Yeah.
ROBLES: I think that's part of our game plan. We do have the go-ahead from the headquarters people to look at that. And I don't think that's an issue.
The key is the compensation and lost opportunity issues are -- that's going to be the lawyers deciding that, their attorneys and NASA's

attorneys getting together. But from the standpoint of the actual EE/CA remediation and, I believe, the replacement well, that's a go.
On the issue of the vapor --
ZUROMSKI: Air stripping.
ROBLES: -- the VOC vapor extraction plant, we are going to continue that agreement. We are working with the City of Pasadena and Cal Tech, who the agreement is with, and we've given Cal Tech the go-ahead to open up those negotiations, get that going, extend the agreement past September 30th, which is the last date for that.
RIPPERDA: And why leave that one little part through Cal Tech instead of bringing that into NASA?
ROBLES: If we brought it into NASA, we might go past the expiration date of the agreement.
ZUROMSKI: Right. Because basically, we're extending what they already have.
ROBLES: So we're going to bring it back. But for now, to facilitate the extension, it's easier to keep it within Cal Tech, since NASA is paying it anyway through Cal Tech, is to have that agreement go through and extend it with, we're thinking, three one-year options until we get the EE/CA and until we get the record of decision for Operable Unit 1 and 3

and then bring it back within NASA. And the NASA agreement is part of the whole record of decision. But for now the issue is that there is an expiration date of the 30th of September for that agreement. And so the fastest way to continue that, and that was one of their concerns, are we still going to be supporting them on that and we said yes, we are. We want to continue that. That's the only reason for that, Mark.
RIPPERDA: Okay.
ZUROMSKI: And so that's everything on Item 6.
Item 7. Does anybody have any other items or issues that they'd like to raise? I know -- I think we've covered pretty much everything that we're working on right now.
Can you think of anything else that we were going -- we've had a couple meetings. We -- on Tuesday we went down to CH2MHILL. They gave us an all-day briefing on what you saw today, only in a lot greater detail.
Change the tape real quick.
And they went through basically to give the customers an update of what's -- what they're working on because we've tasked them with, as you could see, a lot of things, working on the model,

80

working on the EE/CA, working on the evaluation of the different technologies. They're also doing the regulatory analysis that we've talked about for 97-005 and the new bill, which is no longer 2646, but it's another bill. I forget the number.
NEZAFATI: AB 378.
ZUROMSKI: Okay. The other one was --
NEZAFATI: Died.
ZUROMSKI: -- died in the Senate last year, so they reupped it. It's the exact same bill, only it's a new number now.
What else are you guys doing? I think we went over most of that. But anyway, we went over that in fairly good detail on Tuesday to get an update. And to find out what they're doing they brought in all their folks that are working on the project. As Hooshang said earlier, the 12 professionals did include Eric. And they did do the --
NEZAFATI: Including.
ZUROMSKI: Right. And they gave us a -- they gave us a really good update of where they were and the status of their project. Because, as you know, we're trying to push our time line along as quickly as possible to get our extraction system in, get

81

this, you know, removal action moving.
ROBLES: You had a meeting with NASA headquarters.
ZUROMSKI: I had a meeting with NASA. I was at NASA headquarters last Wednesday -- or Tuesday and Wednesday.
On Tuesday I briefed NASA headquarters on all the work we're doing. They are very much supportive of all the work that we're doing.
And then on Wednesday I gave a brief to the Federal Remediation Technologies Round Table on all the different treatment technologies and things that we're working on for perchlorate. And it was a very good meeting because it included folks from all the Department of Defense services, plus other government agencies, such as NASA. NASA actually chaired the meeting and they invited me to talk. That's why I went to that meeting. And then Department of Energy, Department of Interior. Everybody who has any type of involvement in perchlorate. This was specifically on perchlorate. And also EPA was there.
Do you remember the gentleman's name that gave a good talk on both the status of the action levels or MCLs for perchlorate, and also for -- no.

82

I forget his name, too.
RIPPERDA: Kevin Mayer?
ZUROMSKI: Kevin Mayer. Exactly. He gave a good update on what was going on from the EPA side. So it was a very, very informative meeting. Got a lot of information on, basically, state of the art on perchlorate at the time. So that was a good meeting to go to.
And I think that's generally everything we've been working on.
I guess I could almost go back to Item Number 2, just give you a quick update on the public meeting. Everything is ready to go.
Did you get your mailer in the mail at all? I don't know if you're even on that mailing list or not. But everybody I know in the public has gotten their mailer. So (UNINTELLIGIBLE) if you're not on our mailing list. You didn't get -- the mailers did go out and we didn't get them all back, so we know they went out this time.
And we have our newspaper announcements going in. We have both -- some of the newspapers we only did a legal ad because of whatever reason. Some of the newspapers didn't have a good time line for doing a nice ad. But we did get a large -- in

83

the general section, the front page section of the Pasadena Star News we got a general ad in that paper to announce the public meeting. Since that's probably the largest distribution around here, that was probably our best bet.

And then we are also going to do -- a couple of public service announcements are coming up on some local radio stations. And then the two days before the public meeting, the Monday and Tuesday before, that would be the 18th and 19th, we actually have some radio ads running on some of the local stations on those days as well.

We're going to be -- we're trying to get our final coordination with our folks at Cal Tech to get our e-mail sent out to all the people here on site. And then we're also having coordination to get this -- you know, when we go to the cafeteria they have all those monitors. We're going to have all the monitors showing for several times the announcement of the public meeting as well. I think we've done a pretty good job of getting the word out this time.

ROBLES: And then we're also going to use the Raymond Basin --

ZUROMSKI: And the Raymond Basin.

GATES: Yes.

ROBLES: -- to notify every one of their people.

ZUROMSKI: Right.

ROBLES: Particularly Lincoln Avenue, Pasadena.

ZUROMSKI: Right. We'll brief them.

RIPPERDA: That won't be able to happen.

ZUROMSKI: There won't be a mailer this time, but we will brief them and they can -- when they have their board meetings, et cetera, they can brief their folks and let them know what's going on. But as far as actually putting in a mailer, we're going to do that for the groundwater remedies for the site. But that will be in the future.

And that's generally everything we're working on right now.

RIPPERDA: How about the Pasadena Weekly, since they did such a nice piece on you a year or two ago? Are you going to advertise with them, give them money?

ZUROMSKI: Who is that?

ROBLES: Pasadena Weekly.

RIPPERDA: Whatever it's called.

ROBLES: Pasadena Star, you mean?

WOODWARD: No. It is Weekly. It's the one that did the article.

RIPPERDA: It's the weekly paper that --

ZUROMSKI: No, no, no. That's the regular Pasadena Star that did an article on us.

GATES: Oh, is it? Oh.

RIPPERDA: I was being facetious, because it made you guys look like you were poisoning the children.

ZUROMSKI: You mean from the last public meeting?

RIPPERDA: Oh, no. This was about a year ago.

WOODWARD: This was a general article.

GATES: Oh.

ZUROMSKI: I've never seen that, so I don't know. I don't know.

GATES: There was an article in the Pasadena Star --

ZUROMSKI: There was an --

GATES: -- after this last public meeting.

ZUROMSKI: And that was a good one, so I don't know.

GATES: Yeah. That one came out well.

ZUROMSKI: So that's why I was confused. I didn't know what you were talking about.

RIPPERDA: How is the model calibration going? Are you guys pretty far along? Are you almost done?

Are you just getting started?

ROBLES: Getting started.

RIPPERDA: Have you even gotten started?

ARONSON: We're getting started right now. Basically, we've done a little bit with -- run the model probably six or eight times. But still pinning down some of the other types of information.

ZUROMSKI: And part of it is interpreting the pump test data into the model and replacing values that were used from the old Foster Wheeler model with the new values that we're receiving from the pumping tests.

You know, part of that is -- I don't know. We did never receive comments from any of the agencies on the workplan and we maybe waited a little bit too long to see whether we were going to get comments on the workplan before we actually started working on the model. But at a certain point in time we did just give CH2MHILL the go-ahead to get going. I'm not sure. Are we going to -- I didn't think we were going to receive comments on that.

RIPPERDA: I kind of said this at the public meeting where it's like it's a workplan, things look pretty good, like maybe my contractor would have a

few specific comments --
ZUROMSKI: Yeah.
RIPPERDA: -- but didn't get any and I read through it and --
ZUROMSKI: Okay.
RIPPERDA: -- like can't really -- it's like "Yeah. Fine."
ZUROMSKI: I know that Richard said that he wasn't going to have any comments. David said one of his hydrogeologists or somebody was going to have some comments, but they didn't -- we haven't received anything from them, either. So that's why they're pushing forward now full steam. And if you do have any comments, you know, along the way that we need to put in, you know, just let us now.
RIPPERDA: So how long do you think it's going to take before you are ready to be running it for real?
ARONSON: Running it for real? It's obviously going to depend on -- you know, it's a very dynamic site. We're obviously -- we have a fast time schedule, so we'll have to be getting it done probably in the next month. What is today? Like a month, right around there, to be able to start scenarios. But it will be -- you know, the

particular time will be driven very much by the complexity in calibrating it, really.
ZUROMSKI: I think one of the delivery dates, that was like the end of August or something like that for the final everything model.
ARONSON: Correct.
ZUROMSKI: But they'll probably have it -- I think what Eric is saying, they'll probably have it done and rolling before then.
ARONSON: Yeah.
ZUROMSKI: When we actually -- they are doing simulations and simulations that will be included in the EE/CA for the pumping scenarios. Those are all supposed to be done, I guess, the end of August or so --
ARONSON: Right.
ZUROMSKI: -- depending on how the calibration goes.
RIPPERDA: If you're going to get the draft EE/CA to us in early October --
ZUROMSKI: Yeah. Right.
RIPPERDA: I could see having different levels of complexity or different goals in your calibration model, you know, for placing the extraction well which, okay, we know it's going to go about where

the Arroyo Well is, and placing an injection well.
It looks like your calibration just doesn't need to be that good. You could almost just run a 1-D infinite system, almost, to kind of see, well, where best to place things. You know, I'm being a little gross here. But you actually don't need that well a calibrated system to look at that, I don't think.
But down the road, when you start to look at long-term plume migration or maybe at in-situ remediation and where you're going to put your acetate or molasses, how much are you going to put in, are you going to put in multiple wells. You know, at that level you need much better calibration. So when you said that you've got like a date in August for final completion of calibration, you know, I hope that doesn't mean that you'll never, then, go back in and continue to tweak or calibrate or fine tune.
ZUROMSKI: I'm just talking about delivery for getting -- placing -- well placement and things like that.
ARONSON: Supporting the EE/CA.
NEZAFATI: I'm glad you cleared it up, Mark. So yeah. Basically, for this EE/CA, everything is

being driven by the schedule for EE/CA. So we're trying to really, as Peter put it the other day, be more creative or out of the box and try to calibrate the model to the extent that we can use that for EE/CA. But we're going to have to, basically, (UNINTELLIGIBLE) the model at later time for the different kind of applications that we're going to have in the future.
RIPPERDA: Right. I saw you frown when I said "Oh, a 1-D infinite model worked just as well as your like months of painstaking effort." But, you know, in some ways it's true since the placement of both the extraction well and the injection well are going to be heavily driven by land use and availability concerns.
NEZAFATI: Exactly.
ARONSON: It does limit that.
RIPPERDA: What you're really looking at is just kind of a gross, you know, there, there --
NEZAFATI: Yeah.
RIPPERDA: -- or, you know, there kind of scenario. And in that system, you know, it doesn't matter how closely you've calibrated, you know, these drawdown curves between MW-3 and Well 52.
ARONSON: Sure.

RIPPERDA: It's just not that important.
ARONSON: Yeah. It's just more a reaction to 1-D versus -- you know, there, there and there is 2-D. So I was thinking just, you know, in the sense that a little bit of the spatial location, obviously, plays into it. And it's not just sort of down the pipeline issue.
ZUROMSKI: And that's kind of somewhat also the reasons with the spinner-logging right now. It's what we can get done in a reasonable time frame rather than, you know, over the long term. Because, you know, if we can't do the spinner-logging and we can't interrupt the City's production schedule right now, that's not going to stop us from moving forward with the EE/CA, because it can't. So -- but if we can do it, it would be a luxury to get that data, and that would be great. So we're pushing forward. If we can get that data, we can. If not, we're just moving forward with what we're doing.
ROBLES: Okay.
ZUROMSKI: And actually, one other thing on that was -- I mean one thing that came out of our meeting with the City was that they've already resleeved the Arroyo Well, and possibly even using a resleeved Arroyo Well as the site for the extraction system is

92

another thing we're now considering, because that's a whole 'nother option that we're now possibly throwing into the mix, which could save a lot of money and a lot of time.
So try to, you know, like Hooshang was saying, think out of the box, what are the best ways that we can do this quickly, you know, inexpensive, if possible. Of course, treating for perchlorate is not completely inexpensive, but try to get out there, get stuff into the field, what's the best way we can do it. So any options that we can think of we're throwing in the mix.
ROBLES: Okay. If nobody has anything else, when do we want our next meeting?
ZUROMSKI: I guess it would be September, first week of September.
ROBLES: September. September 6th is the first Thursday of the month.
ZUROMSKI: Does that sound good to the few people that are here?
RIPPERDA: Yeah.
ROBLES: All in favor, say. That's Mark.
ZUROMSKI: Okay. Well, we'll shoot for September 6th, then, at 9:30, same time, same place as our next meeting.

93

RIPPERDA: And next conference call?
ZUROMSKI: The next conference call will be -- let me see, now.
ROBLES: I believe we need one in July.
ZUROMSKI: First week of July?
ROBLES: No, because that's the 5th.
ZUROMSKI: 5th.
ROBLES: That's not a good day. That's after Independence Day.
ZUROMSKI: Should we do it on the 12th?
ROBLES: How about the 12th?
ZUROMSKI: 12th of July.
ROBLES: Would that be okay? That's the second Tuesday -- Thursday.
ZUROMSKI: Second Thursday of July.
RIPPERDA: Yeah.
ROBLES: So let's do an RPM telecom.
ZUROMSKI: And then one in August as well.
ROBLES: And the one in August. We have -- the first Thursday of August is the 2nd.
RIPPERDA: Okay.
ROBLES: All right?
ZUROMSKI: Great.
ROBLES: Okay.
ZUROMSKI: Okay. Well, does anybody have any

94

other final issues? Okay.
ROBLES: I just want to impress on you that we are trying to get the EE/CA as soon as possible. We did -- through Richard's briefing of NASA headquarters, they looked at it real well and they are pressing for that. They want something done as quickly just as much as we do, and we're trying every which way to meet that need. And we're working with the City of Pasadena. We're not doing this in a vacuum. So --
ZUROMSKI: NASA is actually very supportive of what I proposed to them. So --
RIPPERDA: And what -- is it AB 378? Is that --
NEZAFATI: 378, yes.
RIPPERDA: What's the exact -- not the exact, but what's the gist of the language in that?
ZUROMSKI: It's the one --
GATES: Same thing.
NEZAFATI: They're basically authorizing the water districts to negotiate or do the remedial work for contaminated wells, in a nutshell. But I'm not quite, you know, clear on the --
ZUROMSKI: Yeah.
NEZAFATI: -- specifics.
ZUROMSKI: It gives the Regional Board -- it

95

gives the water purveyors some power to work with the Regional Board over where water can be extracted and injected for remediation systems so that -- for example, I think the one idea behind the law was to alleviate problems like they had I think in either Sacramento or one of the AeroJet sites, I think, where they were reinjecting contaminated water. Before they knew about perchlorate, they were reinjecting it and basically expanding the size of the plume. So the whole idea is to have them as input into the coordination with the Regional Board. Basically, it makes that official even though we're doing that, really, already by updating the Raymond Basin all the time. So it just gives them official -- a little more, you know, power or teeth in the whole mix. And so that's going to possibly affect what we do as well.

RIPPERDA: And this is going back quite a ways. At least I don't go back as far as you, but I'm going back a ways for me. It wasn't Alex, but it was somebody else from the Regional Board, I think, was basically saying that you can't reinject into a drinking water aquifer, which isn't AB 378.

ZUROMSKI: No.

RIPPERDA: That's just kind of a Regional Board

96

anti-deg policy.

ZUROMSKI: Right.

RIPPERDA: And like, oh, you can do infiltration basins, but you can't reinject.

ZUROMSKI: Right.

RIPPERDA: Is the Regional Board --

ROBLES: That's one of the things that we --

RIPPERDA: -- still talking about that? I haven't heard David or Alex say that in a year and a half, but it is something that's still kind of out there?

ROBLES: It is still kind of out there. The person that we were talking to is the director for the L.A. Regional Water Quality Control Board. I can't remember his name now. And we're looking at that as one of the major issues, whether it's infiltration or reinjection. We would like to do the reinjection. But we would have to coordinate with them on that.

I believe we can get through that. It's just a matter of getting it, really, through the Raymond Basin Board as well. I think both are the two hurdles.

So far, talking on reinjection, they don't seem to have a problem with that. Their biggest

97

concern, this was from the City of Pasadena calling us, if we're going to reinject or reinfiltrate the location, to make sure that we're not going through a contaminated site. We're telling them that we're going on our property and, basically, we want to do reinjection cleaner than what we got it out so that we can have a closed-loop system and also avoid the non-degradation issues.

The question about the non-degradation issue is the bigger concern, and so we have CH2MHILL looking at that, that the Basin Plan says you have a limit. Sometimes it's more stringent than the MCLs. And even though you're pumping it out of the impacted groundwater and you're cleaning it up, and you're even meeting MCLs, but the policy is much more stricter. And that's a concern for us, how do we do that and meet that. And we're trying to work that internally and make a presentation to you and the other RPMs to see what we need to do to resolve that in one sense.

ZUROMSKI: Yeah. I guess there have been some variances. You know, we're really specifically alluding to chloride, sulfate and TDS. And there have been variances for reinjecting that. So we're hoping that that's something that's going to work

98

for us as well.

ROBLES: See, the question is, focusing on the contaminants, cleaning those up, these other noncontaminants, but also issues that are of a concern for non-degredation, do you add that on, because then it's a cost issue and also, more importantly, you can't clean them up to what the Basin Plan says. Then you've got a problem. Then that voids the reinjection issue and then we've got a real big problem. So we're looking at those.

Okay?

RIPPERDA: Yeah.

ZUROMSKI: I think that's it.

ROBLES: I think that's it.

ZUROMSKI: The meeting is adjourned.

(Adjourned at 11:34 a.m.)

99

- NUMBERS -

'69 [1] 59:20;
'70S [1] 9:20;
'NOTHER [1] 93:2;
1,000 [2] 37:15; 38:2;
1-D [4] 15:5; 90:4; 91:10; 92:3;
10 [2] 13:2; 68:11;
10000 [1] 38:7;
100 [4] 26:12; 35:20; 36:9; 38:4;
11 [2] 58:6; 58:14;
11:34 [1] 99:16;
12 [5] 52:24; 64:9; 64:12; 65:1; 81:17;
12TH [3] 94:10; 94:11; 94:12;
13 [1] 68:11;
14 [1] 68:14;
17 [4] 64:7; 64:12; 64:20; 64:24;
18 [4] 53:20; 54:2; 54:8; 58:13;
18TH [1] 84:10;
1939 [1] 37:1;
1995 [1] 35:14;
1998 [1] 10:11;
19TH [1] 84:10;
2,000 [1] 49:21;
2-D [1] 92:4;
20 [4] 13:2; 23:8; 26:24; 27:8;
20-INCH [2] 59:21; 59:22;
200 [1] 14:12;
2000 [1] 35:14;
2001 [2] 3:4; 4:2;
20TH [4] 43:14; 43:15; 43:16; 70:7;
24 [1] 48:14;
25 [1] 43:20;
26 [1] 46:6;
26-INCH [1] 59:23;
2646 [3] 46:6; 48:14; 81:4;
2818 [1] 3:25;
2ND [1] 94:20;
30 [1] 43:16;
300 [1] 52:19;
30TH [2] 79:11; 80:4;
378 [4] 81:6; 95:13; 95:14; 96:23;
500 [1] 27:2;
52 [7] 46:15; 46:16; 54:5; 56:14; 64:21; 64:25; 91:24;
5TH [2] 94:6; 94:7;
600 [1] 52:25;
6TH [2] 93:17; 93:24;
700 [1] 53:1;
90 [2] 55:25; 55:25;
97-005 [3] 46:6; 48:13; 81:4;
9:30 [1] 93:24;
9:44 [1] 5:6;

- A -

A.M [2] 5:6; 99:16;
AB [5] 46:6; 48:14; 81:6; 95:13; 96:23;
ABILITY [2] 8:21; 13:24;
ABLE [22] 4:6; 7:6; 7:7; 7:8; 7:18; 7:19; 7:20; 7:21; 8:1; 8:2; 11:8; 11:12; 20:4; 20:24; 29:11; 50:14; 52:10; 58:17; 66:6; 74:22; 85:6; 88:24;
ABOVE [2] 25:13; 25:13;
ABSOLUTELY [1] 11:17;
ACCOUNT [1] 34:4;
ACCOUNTING [1] 12:12;
ACCURACY [2] 8:21; 39:7;
ACETATE [6] 73:7; 74:5; 74:10; 74:18; 75:2; 90:12;
ACROSS [1] 35:7;
ACTION [8] 48:18; 48:18; 76:21; 76:23; 77:12; 77:24; 82:1; 82:24;
ACTIVE [1] 69:10;
ACTUAL [7] 24:21; 28:4; 31:21; 62:14; 63:10; 64:1; 79:2;
ACTUALLY [48] 5:25; 9:2; 9:18; 11:13; 14:4; 18:13; 19:20; 20:9; 21:12; 21:13; 24:4; 24:16; 26:9; 32:13; 33:9; 35:8; 36:1; 36:4; 36:14; 36:23; 36:25; 41:23; 43:2; 48:21; 50:17; 51:6; 55:25; 58:24; 59:1; 60:7; 60:23; 62:8; 64:14; 65:15; 66:17; 67:5; 67:22; 69:17; 74:22; 77:1; 82:16; 84:10; 85:11; 87:17; 89:11; 90:6; 92:21; 95:11;
AD [3] 83:23; 83:25; 84:2;
ADD [3] 14:2; 73:2; 99:5;
ADDING [1] 5:15;
ADDITION [1] 10:14;
ADDITIONAL [6] 9:3; 30:21; 47:2; 47:23; 48:20; 70:23;
ADDRESS [1] 48:9;
ADDRESSES [1] 45:15;
ADDRESSING [1] 32:3;
ADDS [1] 66:12;
ADEQUATE [1] 73:25;
ADJACENT [1] 58:12;
ADJOURNED [2] 99:15; 99:16;
ADS [1] 84:11;
ADVANTAGE [1] 35:15;
ADVERTISE [1] 85:18;
AEROJET [1] 96:6;
AFFECT [1] 96:16;
AGAINST [2] 17:23; 20:8;
AGENCIES [4] 51:2; 67:10; 82:16; 87:15;
AGENDA [1] 70:4;
AGGRESSIVE [1] 33:13;
AGO [5] 18:14; 26:8; 70:13; 85:17; 86:10;
AGREEMENT [7] 79:7; 79:9; 79:11; 79:16; 79:22; 80:2; 80:4;
AHEAD [12] 20:6; 21:23; 22:13; 23:4; 24:3; 24:5; 24:19; 24:25; 26:5; 26:6; 57:19; 73:21;
AIR [1] 79:5;
ALEX [2] 96:20; 97:9;
ALIGNED [1] 32:7;
ALL-DAY [1] 80:19;
ALLEVIATE [1] 96:5;
ALLOCATES [1] 61:2;
ALLOCATING [1] 13:23;
ALLOCATION [2] 4:19; 13:6;
ALLOW [1] 53:9;
ALLOWS [2] 17:21; 62:16;
ALLUDING [1] 98:23;
ALLUVIAL [1] 30:4;
ALLUVIUM [5] 18:19; 19:1; 19:7; 31:16; 33:8;
ALMOST [6] 12:8; 40:14; 83:11; 86:25; 90:3; 90:4;
ALONG [22] 11:11; 18:24; 19:3; 21:15; 21:16; 23:1; 23:2; 25:10; 25:11; 26:7; 31:9; 31:12; 31:12; 32:4; 34:21; 35:6; 35:9; 49:18; 67:5; 81:24; 86:25; 88:14;
ALTERNATIVE [1] 8:24;
ALTERNATIVES [4] 28:12; 35:25; 48:3; 48:5;
ALWAYS [6] 12:15; 39:3; 40:21; 40:22; 40:23; 59:7;
AMATEUR [1] 29:18;
AMBIENT [1] 54:15;
AMERICAN [1] 6:25;
AMOUNT [6] 12:4; 12:18; 15:25; 36:17; 36:18; 39:15;
ANA [4] 28:15; 28:17; 29:4; 29:16;
ANALYSIS [5] 46:15; 46:20; 46:22; 67:7; 81:3;
ANALYZE [3] 7:8; 22:12; 52:10;
ANALYZING [1] 68:4;
ANIMATION [1] 27:14;
ANISOTROPY [1] 5:24;
ANISTROPY [1] 50:23;
ANNOUNCE [1] 84:3;
ANNOUNCEMENT [1] 84:20;
ANNOUNCEMENTS [2] 83:21; 84:7;
ANSWERED [1] 67:21;
ANTI-DEG [1] 97:1;
ANXIOUS [1] 67:11;
ANYBODY [2] 80:12; 94:25;
ANYMORE [1] 66:15;
ANYWAY [2] 79:22; 81:13;
APART [1] 52:20;
APPLICABILITY [1] 46:5;
APPLICATION [1] 12:12;
APPLICATIONS [1] 91:7;
APPLIED [5] 13:15; 15:13; 16:10; 16:11; 33:10;
APPLY [2] 12:16; 15:18;
APPLYING [4] 8:9; 14:22; 34:7; 40:8;
APPROACH [5] 6:21; 7:3; 45:14; 45:18; 63:2;
APPROPRIATELY [3] 4:17; 15:19; 36:19;
APPROXIMATE [1] 37:16;
APPROXIMATES [1] 38:25;
AQUIFER [13] 49:7; 49:16; 49:19; 51:12; 52:2; 58:6; 58:14; 65:11; 66:5; 72:6; 74:23; 76:1; 96:23;
AQUIFERS [2] 50:15; 50:25;
ARARS [2] 47:7; 48:13;
ARC [1] 27:7;
ARCADIS [1] 73:9;
AREA [24] 6:1; 16:11; 19:21; 20:13; 20:22; 20:25; 21:11; 21:12; 22:6; 23:24; 29:22; 30:23; 32:5; 32:9; 32:24; 33:10; 33:11; 33:12; 33:14; 34:1; 35:2; 35:9; 39:15; 78:15;
AREAS [8] 12:25; 19:6; 23:9; 27:2; 29:24; 32:21; 34:13; 34:14;
ARGUE [1] 66:14;
ARONSON [66] 3:7; 4:4; 5:3; 5:7; 7:12; 7:14; 9:15; 9:17; 10:4; 11:7; 11:22; 11:24; 12:5; 12:23; 13:3; 13:7; 13:13; 15:7; 15:23; 17:17; 18:13; 19:13; 22:22; 22:24; 25:6; 25:24; 28:19; 28:21; 28:25; 29:2; 30:6; 31:6; 31:9; 31:11; 31:15; 32:1; 32:12; 33:5; 33:21; 34:21; 35:13; 35:23; 36:12; 36:14; 37:24; 38:9; 38:24; 39:12; 40:3; 40:17; 41:9; 41:13; 41:17; 42:13; 42:13; 45:1; 67:18; 87:4; 88:19; 89:6; 89:10; 89:16; 90:23; 91:17; 91:25; 92:2;
AROUND [19] 6:1; 6:3; 6:22; 19:22; 20:13; 22:18; 24:13; 25:14; 26:7; 26:12; 31:7; 39:16; 70:15; 70:24; 76:6; 76:8; 77:21; 84:4; 88:24;
ARRIVED [1] 5:4;
ARROYO [14] 32:5; 32:8; 46:6; 46:10; 46:17; 59:6; 59:18; 64:11; 64:25; 76:3; 77:22; 90:1; 92:24; 92:25;
ART [1] 83:6;
ARTICLE [4] 85:25; 86:3; 86:11; 86:15;
ASK [3] 29:21; 56:10; 78:10;
ASKING [1] 25:18;
ASPECTS [2] 22:2; 29:12;
ASSEMBLY [1] 46:6;
ASSIGN [5] 13:9; 18:2; 33:19; 38:20; 60:18;
ASSIGNED [3] 36:19; 40:22; 49:23;
ASSIGNING [2] 40:21; 40:23;
ASSIGNS [1] 61:8;
ASSIST [1] 30:21;
ASSISTED [1] 54:9;
ASSISTING [2] 29:10; 48:15;
ASSISTS [1] 7:9;
ASSUME [2] 36:5; 62:6;
ASSUMED [1] 61:7;
ASSUMPTIONS [2] 23:10; 67:8;
ASYMPTOTIC [1] 70:12;
ATTENDEES [1] 3:6;
ATTORNEYS [3] 78:4; 78:25; 79:1;
AUGUST [9] 44:12; 70:10; 71:3; 89:4; 89:14; 90:16; 94:18; 94:19; 94:20;
AUTHORIZING [1] 95:19;
AVAILABILITY [1] 91:15;
AVAILABLE [3] 52:9; 70:20; 76:15;
AVENUE [5] 56:15; 56:23; 57:6; 64:8; 85:4;
AVERAGE [4] 36:6; 36:8; 37:2; 37:2;
AVOID [1] 98:7;
AWAY [6] 6:12; 14:14; 41:11; 52:20; 68:9; 68:10;
AXIS [2] 55:11; 55:12;

- B -

BACK [34] 7:20; 17:18; 18:8; 18:16; 21:20; 27:7; 30:9; 36:1; 36:3; 37:1; 37:24; 38:19; 41:23; 42:6; 42:6; 46:11; 53:13; 59:4; 59:20; 63:20; 65:15; 67:12; 69:8; 70:18; 71:11; 71:12; 79:19; 80:1; 83:11; 83:19; 90:18; 96:18; 96:19; 96:20;
BACKED [1] 21:23;
BACKGROUND [2] 20:9; 34:16;

BACKWARD [4] 24:15; 24:17; 25:2; 25:9;
BACKWARDS [2] 23:22; 24:11;
BACTERIA [5] 72:5; 72:9; 72:16; 73:18; 74:10;
BALANCE [5] 33:18; 33:22; 36:16; 36:17; 74:19;
BALANCES [1] 36:18;
BALANCING [1] 34:3;
BASE [5] 18:21; 18:21; 20:8; 26:19; 26:20;
BASED [7] 8:23; 13:12; 13:23; 18:2; 46:19; 61:5; 61:11;
BASIC [1] 61:19;
BASICALLY [130] 7:5; 8:5; 8:7; 8:15; 15:7; 16:5; 16:13; 16:16; 16:17; 16:19; 16:23; 18:4; 18:6; 18:18; 19:2; 19:5; 19:19; 20:2; 20:7; 20:21; 21:16; 22:5; 22:8; 22:10; 22:24; 23:9; 23:18; 23:23; 24:6; 24:20; 26:7; 26:25; 27:2; 30:7; 30:8; 31:12; 31:15; 32:8; 32:12; 32:15; 32:20; 33:6; 33:7; 33:21; 34:22; 34:23; 35:13; 37:2; 37:7; 39:6; 39:7; 40:7; 45:17; 45:20; 46:14; 46:23; 47:19; 48:17; 49:4; 49:19; 49:24; 50:3; 50:10; 51:4; 51:15; 51:20; 52:3; 52:15; 52:22; 53:5; 53:8; 53:12; 53:16; 53:20; 54:1; 54:4; 54:14; 54:18; 54:22; 55:1; 55:12; 55:14; 56:1; 56:19; 57:3; 57:10; 57:14; 57:24; 58:3; 58:10; 58:11; 60:15; 60:20; 60:25; 61:2; 61:5; 61:10; 61:23; 62:1; 62:11; 62:20; 62:23; 63:10; 63:21; 64:5; 64:22; 65:5; 65:9; 65:10; 65:11; 65:18; 66:2; 66:4; 69:5; 69:9; 69:12; 69:14; 77:5; 78:7; 79:17; 80:22; 83:6; 87:5; 90:25; 91:5; 95:19; 96:9; 96:12; 96:22; 98:5;
BASIN [23] 17:11; 30:8; 30:8; 31:13; 31:16; 31:17; 31:18; 32:17; 34:24; 34:24; 52:8; 53:7; 53:9; 53:11; 65:9; 65:9; 66:20; 84:24; 84:25; 96:14; 97:22; 98:11; 99:8;
BASINS [6] 14:11; 16:6; 16:16; 16:24; 31:22; 97:4;
BECAME [1] 9:21;
BECOMES [1] 16:11;
BED [4] 71:14; 74:3; 74:4; 74:9;
BEDROCK [12] 19:2; 19:6; 19:16; 19:17; 19:18; 19:23; 21:12; 23:1; 30:9; 31:4; 31:11; 32:13;
BEGIN [3] 15:18; 33:22; 38:17;
BEGINNING [3] 9:19; 41:24; 42:7;
BEHAVES [1] 65:11;
BEHIND [1] 96:4;
BEING [28] 7:18; 7:19; 7:20; 7:20; 16:10; 16:11; 20:4; 20:24; 32:2; 32:20; 34:9; 41:3; 41:4; 46:23; 49:11; 50:15; 53:7; 55:15; 56:4; 58:13; 61:7; 73:7; 74:22; 75:14; 76:4; 86:5; 90:6; 91:1;
BELIEVE [4] 43:19; 79:2; 94:4; 97:20;
BENEFIT [2] 48:23; 51:3;
BENEFITING [2] 47:14; 47:23;
BEST [12] 5:13; 8:24; 22:16; 30:3; 62:23; 64:5; 69:7; 74:20; 84:5; 90:5; 93:6; 93:10;
BET [1] 84:5;
BETTER [6] 30:14; 40:1; 40:3; 62:17; 73:10; 90:14;
BETWEEN [12] 6:16; 12:9; 12:13; 30:7; 32:15; 33:1; 57:13; 58:12; 60:13; 61:3; 63:18; 91:24;
BEYOND [1] 16:15;
BIG [5] 6:5; 38:2; 60:5; 70:2; 99:10;
BIGGER [1] 98:10;
BIGGEST [1] 97:25;
BILL [4] 46:6; 81:4; 81:5; 81:10;
BIT [18] 5:8; 5:17; 6:20; 7:23; 8:16; 8:17; 9:6; 9:25; 10:6; 23:6; 27:17; 47:5; 50:13; 56:25; 57:19; 87:5; 87:16; 92:5;
BLACK [3] 18:23; 63:10; 63:13;
BLANKS [1] 60:13;
BLOCKS [1] 5:16;
BLOW [1] 38:22;
BLUE [5] 54:24; 55:1; 55:2; 63:9; 63:24;
BOARD [12] 34:25; 45:5; 53:9; 85:9; 95:25; 96:2; 96:11; 96:21; 96:25; 97:6; 97:14; 97:22;
BODIES [1] 32:7;
BORE [1] 13:10;
BOTH [14] 21:14; 25:1; 40:16; 45:23; 46:3; 68:12; 68:20; 74:10; 74:12; 74:13; 82:24; 83:22; 91:13; 97:22;
BOUNDARIES [5] 5:22; 31:5; 31:25; 34:20; 39:18;
BOUNDARY [17] 21:16; 23:2; 30:11; 30:11; 30:12; 30:15; 30:20; 30:24; 31:1; 31:14; 33:1; 34:21; 35:7; 35:9; 41:10; 41:18; 41:21;
BOWMAN [1] 76:7;
BOX [2] 91:3; 93:6;
BRAD [1] 76:6;
BREAK [1] 5:2;
BRIEF [6] 22:3; 45:3; 82:10; 85:5; 85:8; 85:9;
BRIEFED [1] 82:7;
BRIEFING [2] 80:19; 95:4;
BRIEFLY [1] 51:10;
BRING [4] 18:1; 20:7; 79:19; 80:1;
BRINGING [1] 79:14;
BROKEN [1] 76:14;
BROUGHT [2] 79:15; 81:16;
BUDGET [6] 32:1; 33:23; 36:20; 38:15; 38:21; 40:5;
BUGS [2] 73:4; 74:5;
BUILD [2] 6:17; 20:14;
BUILT [1] 12:15;
BULLETS [1] 70:5;
BUNCH [4] 51:14; 51:21; 65:22; 68:25;
BURBANK [1] 4:21;
BUSINESS [1] 53:14;

============

- C -

============

CAFETERIA [1] 84:17;
CAL [6] 79:8; 79:9; 79:14; 79:21; 79:22; 84:14;
CALIBRATE [4] 50:20; 66:11; 90:19; 91:3;
CALIBRATED [4] 28:3; 65:15; 90:7; 91:23;
CALIBRATING [3] 22:1; 37:9; 89:2;
CALIBRATION [18] 4:10; 7:10; 7:22; 7:24; 33:19; 35:10; 35:12; 35:17; 35:21; 36:15; 36:22; 39:2; 86:24; 89:17; 89:23; 90:2; 90:15; 90:17;
CALIBRATIONS [1] 28:2;
CALIFORNIA [2] 4:1; 10:10;
CALL [7] 9:13; 62:2; 64:5; 77:11; 77:15; 94:1; 94:2;
CALLED [4] 19:18; 45:20; 60:24; 85:22;
CALLING [2] 65:20; 98:1;
CAME [7] 45:5; 53:23; 57:14; 73:8; 73:12; 86:21; 92:22;
CANADA [5] 20:19; 33:13; 56:24; 67:25; 68:8;
CANNOT [1] 16:21;
CAPILLARY [2] 11:22; 12:18;
CAPTURE [6] 23:23; 25:23; 27:9; 47:16; 75:21; 75:24;
CAPTURED [1] 24:10;
CAPTURING [1] 25:3;
CARE [1] 37:14;
CARRIES [1] 5:21;
CARRYING [1] 39:17;
CASE [3] 30:1; 55:24; 62:6;
CASES [1] 12:9;
CASINGS [1] 76:13;
CELL [1] 55:12;
CENTER [2] 47:13; 47:17;
CERTAIN [2] 54:22; 87:18;
CFEST [2] 8:14; 10:11;
CH2MHILL [8] 3:7; 3:11; 10:2; 42:12; 42:13; 80:18; 87:19; 98:10;
CHAIRED [1] 82:17;
CHANCE [1] 72:18;
CHANGE [3] 4:8; 63:21; 80:21;
CHANGED [1] 33:25;
CHARTS [1] 57:13;
CHECK [2] 10:6; 38:15;
CHEMICALS [2] 48:10; 56:5;
CHILDREN [1] 86:7;
CHLORIDE [1] 98:23;
CHOICE [2] 29:5; 72:9;
CHOOSE [1] 41:18;
CITING [1] 4:13;
CITY [23] 30:19; 48:1; 48:23; 49:17; 50:1; 53:22; 56:14; 56:22; 57:5; 59:8; 59:12; 59:16; 61:20; 76:6; 76:7; 77:5; 77:10; 77:25; 78:2; 79:8; 92:23; 95:9; 98:1;
CITY'S [1] 92:13;
CLAYS [1] 12:20;
CLEAN [1] 99:7;
CLEANER [1] 98:6;
CLEANING [2] 98:14; 99:3;
CLEAR [3] 8:25; 26:14; 95:22;
CLEARED [1] 90:24;
CLOSE [5] 29:9; 61:4; 62:18; 62:20; 65:3;
CLOSED-LOOP [1] 98:7;
CLOSELY [1] 91:23;
CLOSER [1] 64:4;
COARSER [2] 12:19; 60:16;
CODE [4] 9:4; 12:6; 14:4; 45:20;
CODES [3] 8:13; 14:6; 14:7;
COEFFICIENTS [1] 63:4;
COLLECT [1] 69:18;
COLLECTED [1] 64:2;
COLLECTING [1] 48:1;
COLLECTION [1] 77:17;
COLOR [1] 54:24;
COLORS [1] 63:9;
COME [9] 14:9; 19:21; 29:15; 45:13; 58:5; 62:17; 62:19; 71:11; 77:8;
COMFORTABLE [4] 6:24; 7:1; 39:10; 66:8;
COMING [16] 12:3; 13:9; 13:19; 21:7; 30:15; 31:24; 32:24; 34:1; 34:5; 34:23; 36:18; 36:19; 43:14; 49:6; 70:9; 84:7;
COMMENTS [11] 28:9; 43:20; 51:1; 67:12; 87:14; 87:17; 87:21; 88:1; 88:9; 88:11; 88:14;
COMMERCIAL [1] 74:15;
COMMERCIALLY [1] 34:10;
COMMISSION [1] 43:24;
COMMON [1] 76:21;
COMMUNICATE [1] 7:20;
COMMUNICATION [1] 10:7;
COMMUNICATIONS [1] 10:13;
COMPARE [5] 8:18; 39:6; 39:8; 61:5; 63:25;
COMPARED [5] 50:24; 59:22; 61:12; 63:6; 66:5;
COMPARING [1] 37:19;
COMPENSATION [2] 78:4; 78:23;
COMPILED [1] 35:1;
COMPLETE [1] 29:4;
COMPLETED [1] 28:3;
COMPLETELY [3] 15:4; 38:22; 93:9;
COMPLETION [1] 90:16;
COMPLEXITY [2] 89:2; 89:23;
COMPONENT [1] 14:6;
COMPUTER [4] 18:9; 60:24; 61:10; 61:23;
CONCENTRATIONS [1] 27:5;
CONCEPTUALLY [1] 6:20;
CONCERN [6] 48:10; 72:10; 98:1; 98:10; 98:16; 99:5;
CONCERNED [1] 46:9;
CONCERNS [4] 46:17; 67:15; 80:6; 91:15;
CONCLUSIONS [2] 15:18; 34:15;
CONCUR [1] 43:23;
CONDITIONS [9] 8:22; 9:1; 23:25; 24:9; 35:15; 37:3; 37:6; 54:16; 54:16;
CONDUCTIVITY [9] 50:21; 50:24; 50:25; 58:8; 58:11; 62:8; 62:18; 63:3; 63:5;
CONFERENCE [4] 77:11; 77:15; 94:1; 94:2;
CONFLICTING [2] 72:24; 73:11;
CONFUSED [1] 86:22;
CONNECTED [2] 26:16; 47:19;
CONSIDER [1] 67:14;
CONSIDERABLY [2] 4:12; 37:25;

CONSIDERATION [4] 4:22; 7:25; 41:21; 50:7;
CONSIDERATIONS [2] 7:17; 74:21;
CONSIDERED [2] 6:20; 52:22;
CONSIDERING [1] 93:1;
CONSISTENT [3] 37:8; 55:3; 58:1;
CONSTANT [4] 34:20; 34:20; 40:9; 40:15;
CONSTRUCT [2] 45:19; 45:21;
CONSTRUCTION [1] 61:20;
CONSULTING [1] 45:10;
CONTACT [1] 19:23;
CONTAMINANTS [3] 22:9; 78:16; 99:3;
CONTAMINATED [3] 95:21; 96:7; 98:4;
CONTAMINATION [1] 56:4;
CONTENT [1] 11:21;
CONTINUE [5] 54:17; 79:7; 80:5; 80:8; 90:18;
CONTINUING [2] 34:23; 75:1;
CONTINUOUSLY [1] 54:12;
CONTOUR [3] 14:20; 34:25; 35:2;
CONTOURS [3] 19:16; 20:3; 32:12;
CONTRACTOR [5] 73:8; 73:14; 73:15; 73:25; 87:25;
CONTRIBUTED [1] 25:3;
CONTRIBUTES [3] 24:12; 32:4; 39:22;
CONTRIBUTING [1] 23:25;
CONTROL [2] 31:20; 97:14;
CONVERGE [2] 8:21; 40:15;
CONVERGENCE [1] 4:11;
CONVERSELY [1] 5:25;
COORDINATE [2] 59:11; 97:18;
COORDINATED [1] 49:25;
COORDINATING [1] 59:7;
COORDINATION [5] 53:25; 53:25; 84:14; 84:16; 96:11;
CORRESPONDS [1] 58:3;
COST [7] 47:9; 47:12; 50:6; 52:5; 68:24; 74:20; 99:6;
COSTLY [2] 52:23; 53:1;
COUNTY [1] 71:20;
COUPLE [13] 7:14; 9:8; 9:11; 15:22; 18:14; 21:3; 22:5; 22:7; 24:3; 54:21; 76:13; 80:17; 84:7;
COURSE [4] 24:18; 38:9; 43:16; 93:8;
COVERED [1] 80:14;
COVERING [1] 39:14;
CRACKED [1] 76:13;
CREATED [1] 20:2;
CREATES [2] 14:16; 19:20;
CREATING [1] 35:1;
CREATIVE [2] 52:6; 91:3;
CREDIBILITY [1] 66:12;
CRITERIA [3] 4:22; 8:10; 8:11;
CROOKED [1] 76:14;
CROSSING [1] 35:6;
CRYSTALLINE [1] 19:17;
CSR [1] 3:25;
CURRENT [1] 75:3;
CURRENTLY [8] 21:4; 47:15; 54:19; 59:5; 59:9; 70:11; 75:12; 76:15;
CURVES [1] 91:24;
CUSTOMERS [1] 80:23;

=============

- D -

=============

DAM [1] 32:9;
DARK [3] 55:1; 63:23; 63:23;
DARN [1] 16:25;
DATA [39] 7:19; 18:1; 28:4; 33:17; 35:14; 37:25; 39:5; 45:8; 45:9; 45:9; 45:13; 47:2; 47:23; 48:1; 48:20; 53:17; 56:18; 57:3; 59:17; 59:21; 60:18; 60:23; 61:4; 63:10; 65:18; 66:17; 67:3; 68:5; 69:2; 69:8; 72:24; 73:8; 73:11; 75:11; 77:17; 77:20; 87:9; 92:16; 92:18;
DATE [5] 55:22; 79:12; 79:16; 80:4; 90:16;
DATES [3] 55:10; 70:6; 89:3;
DAVID [7] 43:18; 71:16; 71:19; 71:23; 77:2; 88:9; 97:9;
DAVID'S [1] 72:17;
DAY [4] 76:9; 91:2; 94:8; 94:9;
DAYS [6] 43:16; 53:8; 57:16; 57:17; 84:8; 84:12;
DEAL [3] 9:3; 14:17; 17:21;
DEALING [3] 65:19; 72:23; 73:1;
DECENT [1] 39:15;
DECIDED [1] 78:13;
DECIDING [1] 78:25;
DECISION [3] 4:24; 79:25; 80:2;
DECISIONS [1] 6:4;
DECLINES [1] 11:20;
DEEP [1] 33:8;
DEEPER [5] 24:19; 54:24; 55:5; 55:18; 55:23;
DEFENSE [1] 82:15;
DEFENSIBLE [1] 66:13;
DEFINITELY [3] 29:2; 34:16; 39:12;
DEGRADATION [2] 72:24; 73:3;
DEGREE [1] 5:20;
DELAY [4] 12:9; 12:12; 12:13; 15:12;
DELAYS [1] 18:12;
DELINEATE [2] 23:24; 25:10;
DELIVER [1] 74:22;
DELIVERY [3] 74:1; 89:3; 90:20;
DEMANDS [1] 5:8;
DEMONSTRATED [1] 63:22;
DEMONSTRATION [3] 22:4; 42:24; 71:5;
DEMONSTRATIONS [1] 28:6;
DENSE [2] 19:25; 20:12;
DEPARTMENT [3] 82:15; 82:19; 82:19;
DEPEND [2] 59:11; 88:20;
DEPENDENT [1] 39:8;
DEPENDING [5] 7:3; 16:9; 62:13; 75:23; 89:17;
DEPTHS [1] 52:25;
DESCRIBE [1] 15:12;
DESCRIBED [2] 31:19; 52:12;
DESCRIBING [1] 47:24;
DESCRIPTION [1] 61:25;
DESIGN [2] 51:21; 51:22;
DESIGNED [2] 52:2; 52:17;
DESIGNING [2] 9:9; 51:11;
DETAIL [15] 5:20; 6:3; 6:25; 8:17; 16:22; 17:6; 20:22; 20:23; 20:25; 30:13; 43:12; 44:21; 67:16; 80:20; 81:14;
DETAILS [2] 9:12; 61:20;
DETERMINE [3] 15:8; 20:6; 23:12;
DETERMINED [1] 52:16;
DETERMINES [1] 15:5;
DEVELOP [3] 7:7; 7:18; 33:23;
DEVELOPED [7] 9:17; 9:19; 20:11; 32:2; 32:2; 39:21; 45:18;
DEVELOPING [5] 27:20; 34:16; 45:6; 45:14; 48:2;
DEVIL'S [1] 32:9;
DHS [1] 48:13;
DHS' [1] 46:5;
DIAGRAM [1] 47:17;
DIALED [1] 10:16;
DIED [2] 81:8; 81:9;
DIFFERENCE [3] 5:12; 39:25; 63:17;
DIFFERENCES [2] 6:19; 34:4;
DIFFERENT [30] 4:15; 17:22; 20:3; 20:3; 22:19; 24:23; 29:12; 47:14; 47:18; 49:16; 49:20; 50:11; 51:15; 51:18; 52:25; 58:6; 58:14; 61:3; 61:9; 61:16; 63:12; 72:2; 72:3; 73:6; 75:13; 81:2; 82:12; 89:22; 89:23; 91:7;
DIFFICULT [2] 6:15; 22:15;
DIMENSIONS [2] 26:1; 26:10;
DIRECTION [4] 14:19; 16:17; 21:15; 23:20;
DIRECTIONS [2] 21:14; 37:7;
DIRECTOR [1] 97:13;
DISCHARGE [2] 71:18; 71:21;
DISCRETIZATION [1] 39:16;
DISCUSS [1] 77:11;
DISCUSSED [7] 8:11; 44:11; 51:5; 65:5; 77:5; 78:3; 78:7;
DISCUSSION [3] 5:5; 7:13; 10:17;
DISCUSSIONS [1] 30:18;
DISPLAY [5] 7:21; 8:3; 26:18; 26:19; 28:25;
DISPOSAL [1] 22:7;
DISSIPATE [1] 16:9;
DISSIPATES [1] 16:13;
DISSIPATING [1] 16:20;
DISTANCE [1] 56:17;
DISTANCES [2] 51:16; 58:12;
DISTRIBUTE [1] 15:1;
DISTRIBUTED [1] 13:20;
DISTRIBUTING [1] 14:10;
DISTRIBUTION [2] 15:8; 84:4;
DISTRICT [2] 20:19; 71:20;
DISTRICTS [1] 95:20;
DIVIDE [3] 30:7; 33:2; 35:5;
DIVIDES [1] 31:20;
DIVISION [4] 3:9; 10:19; 11:2; 42:19;
DOCUMENTED [2] 37:5; 61:21;
DOCUMENTING [1] 67:6;
DOING [29] 10:15; 15:21; 18:2; 29:13; 37:11; 38:14; 41:7; 41:8; 43:6; 44:22; 45:4; 52:13; 53:5; 60:21; 71:9; 71:15; 72:22; 73:21; 78:12; 81:2; 81:12; 81:15; 82:8; 82:9; 83:25; 89:11; 92:19; 95:9; 96:13;
DOMAIN [1] 18:24;
DONE [16] 19:14; 22:18; 33:14; 46:20; 50:5; 53:12; 63:7; 69:4; 84:21; 86:25; 87:5; 88:22; 89:9; 89:14; 92:10; 95:6;
DONOR [4] 73:2; 73:16; 73:24; 75:2;
DONORS [1] 73:6;
DOTS [1] 63:9;
DOTTED [2] 63:9; 63:18;
DOWN [31] 8:9; 8:13; 8:13; 12:3; 12:19; 18:7; 21:11; 21:11; 21:17; 22:25; 24:20; 30:9; 30:16; 31:24; 32:14; 34:23; 35:8; 54:14; 59:3; 59:12; 66:21; 69:21; 70:12; 70:15; 71:8; 71:16; 71:25; 80:18; 87:7; 90:9; 92:7;
DOWNGRADIENT [6] 20:16; 22:6; 23:14; 30:20; 34:19; 41:10;
DOWNWARD [1] 21:13;
DOZEN [2] 29:9; 29:17;
DRAFT [8] 43:19; 44:4; 44:4; 44:14; 44:16; 70:9; 75:15; 89:19;
DRAINAGE [1] 12:22;
DRAINAGES [1] 32:4;
DRAINS [1] 33:8;
DRAW [2] 15:17; 34:14;
DRAWDOWN [5] 55:7; 55:25; 62:14; 62:15; 91:24;
DRAWDOWNS [2] 62:9; 62:19;
DRAWING [2] 13:16; 70:13;
DRINKING [2] 50:16; 96:23;
DRIVEN [3] 89:1; 91:1; 91:14;
DRIVING [3] 41:10; 41:19; 56:6;
DROP [1] 23:19;
DRY [4] 4:15; 13:6; 13:18; 40:12;
DUE [2] 4:11; 22:9;
DUMPING [1] 16:6;
DURING [2] 38:17; 43:15;
DUTCH [1] 60:25;
DWR [1] 18:19;
DYNAMIC [6] 4:18; 8:22; 13:5; 39:14; 49:14; 88:20;
DYNAMICALLY [2] 13:21; 61:2;

=============

- E -

=============

E-MAIL [1] 84:15;
EACH [9] 6:3; 8:16; 13:21; 17:23; 17:23; 24:22; 62:18; 64:18; 76:9;
EARLIER [3] 64:15; 70:6; 81:17;
EARLY [2] 9:19; 89:20;
EASIER [2] 30:13; 79:20;
EASILY [1] 18:1;
EAST [4] 9:18; 9:21; 21:14; 21:15;
EASTERN [1] 23:2;
EASY [1] 28:25;
EDGE [7] 5:24; 19:1; 25:12; 31:8; 31:8; 31:15; 32:17;
EDGES [2] 18:25; 31:7;
EE/CA [30] 28:11; 43:7; 44:14; 44:16; 47:11; 47:18; 47:21; 48:3; 48:11; 48:15; 48:16; 48:17; 75:5; 75:15; 75:19; 75:20; 75:24; 76:20; 76:24; 79:2; 79:24; 81:1; 89:13; 89:20; 90:23; 90:25; 91:1; 91:5; 92:15; 95:3;

EFFECT [1] 17:14;
EFFECTIVE [5] 68:24; 73:7; 73:18; 74:6; 74:18;
EFFECTIVELY [1] 72:12;
EFFECTIVENESS [1] 48:4;
EFFECTS [2] 17:13; 17:15;
EFFICIENCY [1] 8:19;
EFFICIENT [1] 22:18;
EFFICIENTLY [6] 4:6; 5:15; 7:7; 7:9; 7:18; 8:3;
EFFORT [2] 24:11; 91:11;
EIGHT [1] 87:6;
EITHER [3] 31:3; 88:12; 96:5;
ELABORATE [1] 40:6;
ELECTRON [3] 73:2; 73:16; 75:2;
ELEMENT [5] 5:12; 6:9; 9:2; 39:23; 40:1;
ELEMENTS [7] 5:15; 5:23; 5:24; 6:6; 6:16; 7:2; 39:24;
ELEVATION [6] 24:24; 26:13; 26:17; 55:10; 55:11; 55:13;
ELEVATIONS [2] 32:13; 55:21;
ELIMINATED [1] 72:13;
ENCOURAGE [1] 67:11;
END [12] 7:20; 13:4; 21:20; 24:7; 24:10; 25:2; 25:16; 44:5; 44:12; 62:22; 89:4; 89:14;
ENDED [2] 52:13; 53:5;
ENDS [1] 5:22;
ENERGY [1] 82:19;
ENGINEERING [5] 34:16; 45:25; 47:8; 47:11; 78:8;
ENOUGH [3] 32:23; 41:11; 53:21;
ENSEMBLE [1] 26:15;
ENTAIL [1] 50:5;
ENTAILS [2] 51:10; 51:20;
ENTIRE [1] 33:21;
EPA [4] 3:12; 42:10; 82:22; 83:4;
EQUALS [2] 38:21; 40:10;
EQUATIONS [1] 61:25;
EQUIPMENT [1] 59:3;
ERIC [14] 3:7; 17:16; 18:9; 29:18; 30:2; 39:10; 42:13; 45:4; 45:16; 45:20; 45:22; 49:1; 81:18; 89:8;
ESSENCE [1] 47:16;
ESSENTIALLY [1] 13:13;
ESTIMATE [2] 47:9; 47:12;
ESTIMATES [3] 34:17; 62:16; 62:17;
ETHANOL [2] 74:8; 74:11;
EUROPE [1] 9:22;
EVALUATE [3] 48:4; 60:17; 76:17;
EVALUATED [1] 50:10;
EVALUATING [5] 35:25; 47:6; 54:20; 60:4; 73:20;
EVALUATION [10] 8:6; 45:25; 46:4; 47:9; 47:12; 60:23; 63:8; 69:13; 75:13; 81:1;
EVEN [8] 33:22; 53:3; 83:15; 87:3; 92:24; 96:12; 98:13; 98:15;
EVENT [1] 44:20;
EVENTS [2] 43:11; 67:14;
EVENTUALLY [1] 57:25;
EVER [1] 9:23;
EVERY [5] 54:13; 64:4; 77:14; 85:2; 95:8;
EVERYBODY [6] 28:15; 28:17; 48:24; 77:4; 82:20; 83:16;
EVERYTHING [12] 18:16; 25:13; 28:22; 33:4; 66:22; 80:11; 80:14; 83:9; 83:13; 85:14; 89:5; 90:25;
EX-SITU [2] 46:3; 75:13;
EXACT [6] 57:10; 57:14; 66:20; 81:10; 95:15; 95:15;
EXACTLY [13] 16:1; 17:8; 28:7; 36:7; 36:13; 40:11; 41:12; 60:2; 68:10; 68:17; 68:21; 83:3; 91:16;
EXAMPLE [4] 22:4; 22:20; 43:13; 96:4;
EXAMPLES [1] 9:11;
EXCEPTION [1] 32:7;
EXERCISE [1] 67:6;
EXISTING [4] 45:9; 51:8; 51:24; 52:15;
EXISTS [1] 57:21;
EXIT [2] 21:23; 22:13;
EXPAND [1] 30:24;
EXPANDED [2] 29:22; 70:22;
EXPANDING [6] 30:1; 30:19; 31:1; 44:5; 71:1; 96:9;
EXPECT [1] 16:18;
EXPEDITING [1] 7:10;
EXPENSIVE [3] 74:13; 74:16; 74:19;
EXPERIENCING [1] 22:9;
EXPIRATION [2] 79:16; 80:3;
EXPLAIN [2] 50:9; 50:12;
EXPLAINED [1] 45:22;
EXPLAINING [1] 56:3;
EXPORT [5] 7:8; 7:19; 8:1; 26:16; 27:6;
EXPORTED [1] 27:14;
EXTEND [4] 18:24; 18:25; 79:11; 79:23;
EXTENDED [1] 37:22;
EXTENDING [1] 79:18;
EXTENDS [2] 31:16; 31:17;
EXTENSION [1] 79:20;
EXTENSIVE [1] 16:21;
EXTENT [7] 18:19; 18:23; 19:11; 19:13; 20:6; 21:7; 91:4;
EXTRACTED [2] 41:4; 96:2;
EXTRACTING [1] 62:4;
EXTRACTION [19] 51:11; 51:16; 51:17; 52:21; 52:24; 62:4; 65:22; 66:2; 68:20; 70:23; 71:1; 74:1; 75:21; 77:24; 79:6; 81:25; 89:24; 91:13; 92:25;

=============

- F -

=============

FACE-TO-FACE [1] 77:15;
FACETIOUS [1] 86:5;
FACILITATE [1] 79:20;
FACT [3] 52:7; 56:5; 60:13;
FAIRLY [4] 8:24; 19:3; 72:25; 81:14;
FALL [1] 4:12;
FALLING [1] 40:19;
FALLS [3] 12:14; 32:21; 33:7;
FARTHER [3] 6:12; 30:16; 37:24;
FAST [2] 12:22; 88:21;
FASTEST [1] 80:5;
FAVOR [1] 93:22;
FEASIBLE [2] 52:22; 59:6;
FEATURE [1] 4:19;
FEATURES [3] 7:15; 19:15; 22:2;
FEDERAL [1] 82:11;
FEED [2] 15:2; 76:20;
FEEDBACK [1] 67:12;
FEEDING [2] 16:20; 57:25;
FEEL [7] 21:8; 21:17; 24:8; 27:10; 27:12; 30:14; 39:10;
FEET [6] 13:2; 14:12; 52:19; 53:1; 55:11; 55:25;
FEFLOW [20] 8:14; 9:1; 9:1; 9:6; 9:16; 9:17; 10:10; 10:12; 17:18; 17:25; 20:7; 22:10; 22:13; 22:16; 23:4; 29:23; 39:11; 40:3; 45:20; 60:21;
FELT [1] 29:23;
FEW [9] 11:15; 33:14; 53:8; 56:10; 57:16; 57:17; 72:20; 88:1; 93:19;
FIELD [1] 93:10;
FIGURE [2] 58:2; 68:5;
FILTER [1] 74:8;
FINAL [5] 44:8; 84:14; 89:5; 90:16; 95:1;
FINALIZING [1] 44:10;
FIND [2] 74:14; 81:15;
FINDING [2] 30:21; 46:7;
FINDINGS [1] 50:4;
FINE [4] 43:3; 60:14; 88:7; 90:19;
FINER [4] 5:20; 20:22; 20:23; 20:25;
FINISHED [1] 42:23;
FINITE [12] 5:12; 5:12; 5:24; 6:9; 6:16; 6:19; 7:2; 9:2; 39:23; 39:24; 39:24; 40:1;
FIRST [12] 14:3; 23:16; 30:1; 31:4; 51:23; 69:15; 70:6; 72:4; 93:15; 93:17; 94:5; 94:20;
FIT [1] 64:6;
FIXED [2] 35:9; 35:9;
FLEXIBILITY [1] 6:18;
FLOW [42] 6:21; 8:9; 9:2; 12:6; 12:7; 14:4; 14:5; 14:8; 14:13; 14:18; 14:25; 16:2; 16:17; 17:3; 17:3; 17:9; 19:21; 21:15; 22:11; 30:7; 33:1; 34:22; 35:3; 35:3; 35:5; 35:14; 36:10; 37:3; 37:6; 40:9; 45:23; 49:5; 49:5; 49:10; 49:15; 49:21; 57:8; 57:21; 61:2; 61:8; 61:25; 72:15;
FLOWING [2] 17:12; 35:6;
FLOWS [2] 33:15; 34:17;
FLUCTUATES [1] 13:1;
FLUCTUATING [1] 4:7;
FLUIDIZED [1] 74:9;
FLUX [6] 35:9; 36:8; 40:16; 40:22; 41:6; 41:18;
FOCUS [3] 72:14; 75:24; 76:1;
FOCUSED [1] 56:18;
FOCUSING [3] 46:1; 75:20; 99:2;
FOLKS [5] 76:6; 81:16; 82:14; 84:14; 85:10;
FORCE [1] 56:6;
FORGET [3] 74:2; 81:5; 83:1;
FORMERLY [1] 10:11;
FORTH [1] 17:18;
FORWARD [14] 23:11; 23:18; 23:20; 24:2; 24:5; 25:16; 26:22; 29:7; 29:15; 35:18; 88:13; 92:14; 92:17; 92:19;
FOSTER [1] 87:10;
FOUND [3] 32:18; 72:3; 74:6;
FOUR [8] 21:6; 57:23; 58:6; 58:7; 58:7; 58:9; 62:5; 70:5;
FOURTH [1] 31:2;
FRAME [5] 37:1; 44:6; 44:15; 71:3; 92:10;
FREE [1] 11:18;
FREEWAYS [1] 20:10;
FRINGE [2] 11:22; 12:18;
FRITZ [1] 67:24;
FRONT [2] 10:6; 84:1;
FROWN [1] 91:9;
FS [1] 61:21;
FULL [5] 6:25; 15:21; 29:11; 42:7; 88:13;
FULLY [3] 60:8; 60:12; 61:16;
FURTHER [1] 6:6;
FUTURE [10] 29:25; 30:22; 35:24; 49:2; 66:11; 67:14; 68:13; 70:24; 85:13; 91:8;

=============

- G -

=============

GAIN [1] 67:12;
GAME [1] 78:20;
GARY [1] 76:7;
GATE [1] 32:9;
GATES [19] 3:8; 17:1; 22:20; 22:23; 28:15; 28:18; 28:20; 28:24; 29:1; 42:16; 42:16; 58:20; 85:1; 86:4; 86:12; 86:15; 86:18; 86:21; 95:18;
GAVE [9] 70:5; 70:5; 75:5; 80:18; 81:21; 81:22; 82:10; 82:24; 83:3;
GENERAL [5] 44:19; 70:2; 84:1; 84:2; 86:11;
GENERALLY [9] 4:18; 6:19; 12:5; 20:22; 35:2; 35:3; 43:25; 83:9; 85:14;
GENTLEMAN'S [1] 82:23;
GEOMETRY [2] 5:11; 8:25;
GERAGHTY [1] 73:9;
GERMAN [2] 9:18; 22:20;
GERMANY [2] 9:21; 22:23;
GETS [2] 24:10; 28:15;
GETTING [22] 21:22; 24:8; 27:12; 38:12; 51:13; 59:17; 64:4; 66:10; 69:3; 69:19; 75:9; 75:16; 77:19; 78:5; 79:1; 84:21; 87:1; 87:2; 87:4; 88:22; 90:21; 97:21;
GEYERSING [1] 40:13;
GIS [2] 17:20; 18:1;
GIST [1] 95:16;
GIVE [11] 21:2; 28:8; 29:11; 45:3; 58:14; 62:3; 77:3; 80:22; 83:12; 85:18; 87:19;
GIVEN [8] 49:6; 49:22; 52:7; 58:2; 60:13; 62:10; 72:18; 79:9;
GIVES [10] 7:22; 21:17; 26:15; 48:24; 49:10; 63:2; 65:2; 95:25; 96:1; 96:14;
GLAD [1] 90:24;
GO-AHEAD [3] 78:21; 79:10; 87:19;
GOALS [1] 89:23;

GOES [3] 13:6; 19:22; 89:18;
GOOD [22] 21:17; 25:20; 27:23; 29:20; 35:7; 37:12; 62:15; 65:2; 77:17; 81:14; 81:22; 82:14; 82:24; 83:4; 83:7; 83:24; 84:21; 86:19; 87:25; 90:3; 93:19; 94:8;
GOTTEN [3] 43:19; 83:17; 87:3;
GOVERNING [1] 61:24;
GOVERNMENT [1] 82:16;
GPM [1] 49:21;
GRADE [1] 6:1;
GRADIENT [2] 37:7; 56:2;
GRADIENTS [1] 13:22;
GRADUALLY [1] 15:13;
GRAIN [1] 60:14;
GRAPH [3] 55:9; 55:21; 63:8;
GRAPHS [1] 56:7;
GREAT [10] 9:3; 14:17; 17:21; 39:23; 41:8; 42:21; 65:6; 72:10; 92:17; 94:23;
GREATER [2] 5:20; 80:20;
GRID [1] 5:16;
GROSS [2] 90:6; 91:19;
GROUND [5] 12:10; 12:14; 21:12; 70:14; 73:17;
GROUNDWATER [34] 14:11; 15:2; 16:5; 16:8; 16:17; 16:20; 20:12; 21:15; 27:20; 37:6; 40:5; 41:1; 45:6; 45:17; 45:19; 45:21; 46:1; 47:3; 47:9; 47:22; 48:3; 48:7; 48:10; 49:1; 55:9; 55:11; 55:14; 55:21; 56:5; 57:21; 65:9; 75:25; 85:12; 98:14;
GUESS [16] 10:11; 11:4; 26:3; 40:20; 54:24; 56:3; 66:8; 67:20; 68:12; 71:19; 76:13; 77:2; 83:11; 89:14; 93:15; 98:21;
GUYS [8] 9:6; 11:5; 41:8; 43:23; 44:6; 81:12; 86:6; 86:25;

- H -

H [1] 3:11;
HALF [3] 15:15; 53:1; 97:10;
HANDLE [4] 4:7; 8:8; 11:19; 14:3;
HANDLES [1] 14:5;
HANDLING [1] 11:18;
HANDY [1] 14:10;
HAPPEN [3] 15:9; 25:7; 85:6;
HAPPENED [1] 18:15;
HAPPENS [3] 26:25; 27:4; 39:19;
HAPPY [1] 69:17;
HAVING [5] 30:15; 40:15; 71:17; 84:16; 89:22;
HEAD [2] 34:20; 35:9;
HEADQUARTERS [5] 78:21; 82:3; 82:5; 82:7; 95:5;
HEARD [1] 97:9;
HEARING [1] 37:12;
HEAVILY [2] 4:25; 91:14;
HEIGHT [1] 13:22;
HELD [3] 5:5; 7:13; 10:17;
HELP [2] 30:20; 78:12;
HELPED [2] 54:1; 54:9;
HELPS [1] 5:14;
HERE'S [3] 20:11; 20:16; 23:3;
HI [2] 10:21; 10:22;
HIEROGLYPHICS [1] 38:18;
HIGH [5] 13:22; 19:16; 32:20; 36:11; 56:2;
HIGHLY [1] 15:24;
HILL [1] 19:18;
HILLSTROM [10] 3:9; 10:18; 10:22; 10:24; 11:1; 11:1; 11:10; 11:12; 42:18; 42:18;
HISTORICAL [2] 68:5; 69:8;
HISTORY [1] 77:20;
HITS [1] 15:19;
HOLD [1] 7:11;
HOLDING [1] 12:21;
HOOSHANG [15] 3:11; 16:2; 42:12; 42:25; 43:4; 44:11; 44:21; 44:24; 58:23; 59:16; 64:15; 75:5; 77:18; 81:17; 93:5;
HOPE [1] 90:17;
HOPEFULLY [2] 44:7; 71:3;
HOPING [2] 71:16; 98:25;
HORIZONTAL [3] 50:23; 58:10; 63:5;
HOURS [1] 54:13;
HOUSE [1] 22:16;
HURDLES [1] 97:23;
HYDRAULIC [14] 50:15; 50:19; 50:21; 50:24; 50:25; 52:12; 58:8; 58:10; 62:7; 62:7; 62:7; 62:18; 63:3; 63:5;
HYDROGEOLOGIST [1] 67:23;
HYDROGEOLOGISTS [1] 88:10;

- I -

IDEA [9] 9:10; 15:11; 23:5; 26:2; 26:10; 26:15; 26:25; 96:4; 96:10;
IDENTIFIED [1] 8:6;
IDENTIFYING [5] 8:8; 34:5; 34:13; 45:11; 48:19;
ILLUSTRATES [1] 5:17;
IMMEDIATE [1] 12:25;
IMPACT [2] 41:13; 46:23;
IMPACTED [3] 55:15; 56:4; 98:14;
IMPACTING [4] 23:14; 27:4; 41:15; 46:18;
IMPACTS [1] 22:9;
IMPLEMENT [1] 54:2;
IMPLEMENTATION [1] 54:10;
IMPLY [1] 16:22;
IMPORT [3] 7:7; 7:19; 8:2;
IMPORTANT [7] 7:25; 17:19; 19:8; 41:20; 50:8; 50:14; 92:1;
IMPORTANTLY [2] 7:21; 99:7;
IMPRESS [1] 95:2;
IN-SITU [5] 46:3; 72:21; 72:24; 73:3; 90:10;
INCLUDE [3] 33:6; 67:3; 81:18;
INCLUDED [3] 68:3; 82:14; 89:12;
INCLUDES [1] 31:21;
INCLUDING [7] 21:21; 29:13; 29:19; 29:19; 43:18; 53:16; 81:20;
INCREASE [1] 33:25;
INCREASINGLY [3] 9:23; 9:23; 9:24;
INCREDIBLE [1] 15:25;
INDEPENDENCE [1] 94:9;
INDICATE [1] 32:16;
INDICATED [1] 56:6;
INDICATES [1] 56:1;
INDICATION [1] 49:10;
INDUSTRIAL [1] 34:10;
INEXPENSIVE [2] 93:7; 93:9;
INFILTRATION [2] 97:3; 97:17;
INFINITE [2] 90:4; 91:10;
INFLOW [3] 32:10; 33:3; 33:18;
INFLUENCE [3] 68:15; 68:18; 74:24;
INFLUENCED [1] 35:4;
INFLUENCES [1] 59:24;
INFLUENCING [2] 56:20; 68:6;
INFORM [1] 77:3;
INFORMATION [38] 7:8; 7:8; 8:2; 8:2; 17:22; 18:2; 20:5; 26:17; 27:7; 27:13; 35:1; 35:16; 37:20; 46:19; 46:22; 46:24; 48:24; 48:25; 49:13; 49:24; 52:9; 52:11; 53:4; 54:19; 56:8; 57:3; 57:18; 57:25; 58:5; 61:17; 64:1; 65:12; 66:9; 66:11; 69:18; 69:20; 83:6; 87:7;
INFORMATIVE [1] 83:5;
INITIAL [8] 8:7; 36:14; 38:17; 43:19; 61:7; 62:16; 63:15; 73:5;
INITIALLY [4] 15:7; 16:12; 62:6; 72:10;
INJECT [1] 73:17;
INJECTED [1] 96:3;
INJECTING [1] 68:19;
INJECTION [4] 20:17; 68:20; 90:1; 91:13;
INPUT [4] 36:6; 40:16; 41:6; 96:11;
INSIDE [1] 21:21;
INSTALL [2] 51:22; 53:4;
INSTALLATION [1] 49:3;
INSTANCE [2] 52:16; 54:23;
INSTEAD [1] 79:14;
INTEGRATED [1] 15:4;
INTEGRATES [1] 13:11;
INTERCEPT [1] 49:20;
INTERESTED [2] 20:23; 51:13;
INTERESTING [3] 21:3; 26:3; 30:6;
INTERFACE [1] 6:23;
INTERFACES [1] 31:12;
INTERIOR [1] 82:19;
INTERNAL [2] 44:14; 75:15;
INTERNALLY [1] 98:18;
INTERPRETING [1] 87:8;
INTERPRETIVE [1] 25:15;
INTERRUPT [3] 59:4; 59:13; 92:13;
INTERSECTS [2] 19:6; 19:20;
INTERVAL [1] 13:14;
INTERVALS [4] 60:9; 60:10; 60:11; 61:16;
INTRODUCE [2] 22:2; 42:4;
INTRODUCING [1] 9:10;
INTRODUCTION [4] 9:25; 22:3; 27:17; 42:7;
INVERSE [3] 61:8; 62:2; 63:1;
INVESTIGATION [1] 69:16;
INVITED [1] 82:17;
INVITING [1] 29:15;
INVOLVE [1] 58:22;
INVOLVED [3] 45:24; 47:15; 52:24;
INVOLVEMENT [1] 82:20;
INVOLVES [1] 30:12;
IRREGULAR [1] 5:11;
IRRIGATION [2] 20:19; 33:10;
ISOLATE [1] 74:5;
ISOLATED [1] 72:5;
ISSUE [13] 4:10; 4:13; 5:12; 17:6; 74:24; 78:17; 78:22; 79:4; 80:3; 92:7; 98:10; 99:6; 99:9;
ISSUES [17] 4:11; 4:16; 5:7; 5:9; 29:24; 40:20; 48:13; 71:17; 72:25; 74:22; 78:3; 78:24; 80:13; 95:1; 97:16; 98:8; 99:4;
ITEM [12] 41:22; 42:22; 42:24; 50:8; 70:4; 71:6; 71:7; 75:5; 76:25; 80:11; 80:12; 83:11;
ITEMS [4] 43:5; 48:21; 77:12; 80:12;
ITERATIVE [1] 62:17;
ITERATIVELY [1] 64:3;

- J -

J [1] 3:15;
JOB [2] 41:8; 84:21;
JPL [19] 3:14; 5:9; 8:22; 20:1; 20:12; 21:11; 27:20; 42:11; 45:4; 45:7; 45:12; 45:22; 47:10; 47:13; 48:19; 51:9; 72:5; 72:15; 74:5;
JR [2] 3:13; 3:15;
JULY [5] 70:9; 94:4; 94:5; 94:12; 94:15;
JULY/AUGUST [1] 44:6;
JUNE [5] 3:4; 4:2; 43:14; 43:15; 43:16;
JUSTIFY [2] 28:12; 30:13;

- K -

K [2] 3:25; 61:7;
KEEP [1] 79:21;
KEVIN [2] 83:2; 83:3;
KEY [2] 41:9; 78:23;
KIMBERLY [2] 3:8; 42:16;
KIND [39] 6:24; 9:9; 13:10; 17:17; 18:22; 21:8; 21:11; 21:25; 22:3; 24:8; 25:1; 26:2; 26:4; 27:12; 27:14; 32:14; 33:17; 34:23; 36:5; 48:25; 50:19; 55:4; 58:23; 62:9; 63:1; 64:15; 64:17; 72:18; 73:19; 74:23; 87:23; 90:4; 91:7; 91:19; 91:21; 92:8; 96:25; 97:10; 97:12;

- L -

L.A [1] 97:14;
LA [5] 20:19; 33:13; 56:24; 67:25; 68:8;
LABORATORY [1] 3:3;
LABS [3] 10:8; 10:12; 10:13;
LACTATE [1] 74:15;
LAGS [1] 57:12;
LAKE [1] 22:24;
LAND [3] 34:7; 34:8; 91:14;
LANGUAGE [1] 95:16;
LAPTOP [1] 22:16;
LARGE [8] 5:10; 8:6; 55:18; 65:8; 65:24; 70:17; 74:16; 83:25;
LARGE-SCALE [2] 47:25; 50:10;
LARGELY [1] 34:9;

LARGER [5] 22:17; 22:19; 51:4; 52:10; 66:6;
LARGEST [1] 84:4;
LAST [6] 59:16; 79:12; 81:9; 82:5; 86:8; 86:18;
LATE [1] 9:20;
LATER [7] 15:15; 15:15; 43:12; 44:14; 47:5; 47:24; 91:6;
LAW [1] 96:4;
LAWYERS [1] 78:25;
LAYER [7] 24:16; 24:19; 24:20; 31:2; 31:4; 58:4; 61:6;
LAYERS [16] 4:15; 4:15; 20:3; 21:6; 24:23; 31:3; 57:23; 58:2; 58:7; 58:7; 58:12; 61:3; 61:9; 61:12; 62:5; 62:5;
LEADING [3] 47:20; 48:11; 48:15;
LEARNED [1] 53:6;
LEAST [8] 4:24; 13:4; 16:12; 37:5; 38:23; 52:7; 61:15; 96:19;
LEAVE [2] 35:17; 79:13;
LEAVES [1] 12:10;
LEAVING [2] 34:2; 34:2;
LEGAL [1] 83:23;
LEGEND [1] 27:1;
LEND [1] 7:5;
LESS [6] 13:25; 28:23; 34:11; 74:15; 74:16; 78:18;
LETICIA [2] 3:14; 42:11;
LEVEL [5] 25:15; 30:12; 69:12; 76:16; 90:14;
LEVELS [15] 4:8; 32:13; 32:14; 32:17; 33:24; 34:1; 36:11; 37:2; 40:19; 53:11; 62:24; 70:12; 71:11; 82:25; 89:22;
LIGHT [3] 9:8; 54:24; 55:2;
LIKELY [1] 44:15;
LIMIT [2] 91:17; 98:12;
LIMITED [3] 30:24; 37:25; 68:24;
LINCOLN [8] 56:15; 56:23; 57:6; 64:8; 64:21; 64:21; 64:25; 85:4;
LINE [16] 18:23; 25:9; 25:10; 34:22; 35:3; 35:3; 35:6; 46:11; 46:16; 63:13; 63:18; 63:23; 63:23; 63:24; 81:24; 83:24;
LINES [4] 26:7; 44:23; 63:18; 67:5;
LINKED [1] 18:10;
LIST [2] 83:16; 83:18;
LITER [1] 27:3;
LITTLE [32] 5:8; 5:17; 6:12; 6:20; 7:1; 7:23; 8:16; 8:17; 9:6; 18:12; 18:22; 21:10; 22:15; 23:6; 23:17; 27:17; 28:22; 30:2; 30:16; 32:23; 40:6; 47:4; 50:13; 56:25; 57:18; 74:14; 79:13; 87:5; 87:16; 90:6; 92:5; 96:15;
LIVERMORE [1] 10:9;
LOAD [1] 28:18;
LOADING [1] 72:3;
LOCAL [9] 9:1; 14:18; 16:15; 16:21; 16:23; 32:8; 48:22; 84:8; 84:11;
LOCALIZED [2] 17:13; 17:14;
LOCATE [2] 6:9; 6:15;
LOCATED [7] 5:19; 20:18; 22:23; 24:22; 30:15; 51:15; 52:19;
LOCATING [1] 41:21;
LOCATION [7] 20:17; 54:4; 62:3; 64:18; 78:12; 92:5; 98:3;
LOCATIONS [5] 6:17; 19:24; 20:13; 30:21; 52:4;
LOCK [1] 38:16;
LOCKING [1] 38:16;
LOGS [2] 58:22; 77:19;
LONG [11] 6:22; 28:10; 35:3; 35:11; 36:23; 37:18; 38:11; 38:11; 87:16; 88:16; 92:11;
LONG-TERM [2] 34:22; 90:10;
LONGER [5] 18:12; 35:19; 49:19; 76:12; 81:4;
LOOK [46] 6:24; 8:16; 9:10; 14:10; 15:8; 15:17; 17:22; 22:4; 23:4; 23:6; 23:17; 23:20; 23:22; 24:15; 24:23; 25:12; 25:21; 26:1; 26:10; 26:24; 27:14; 28:11; 30:3; 33:21; 34:7; 34:8; 34:13; 35:25; 38:13; 51:23; 64:14; 64:15; 66:19; 66:24; 67:1; 68:15; 68:18; 68:22; 70:20; 75:17; 75:18; 78:22; 86:6; 87:24; 90:7; 90:9;
LOOKED [18] 4:23; 5:1; 23:9; 25:4; 46:12; 46:14; 46:14; 47:1; 48:21; 51:6; 53:15; 57:23; 69:5; 76:10; 76:10; 76:14; 77:22; 95:5;
LOOKING [52] 4:14; 5:11; 6:2; 7:15; 12:9; 12:11; 13:13; 13:15; 13:21; 15:11; 17:19; 19:4; 21:5; 21:20; 21:21; 22:12; 23:3; 23:23; 24:11; 27:3; 27:11; 29:7; 29:14; 32:3; 32:12; 33:24; 34:2; 34:3; 35:13; 36:15; 37:4; 38:15; 40:18; 40:19; 44:10; 44:13; 46:2; 46:4; 48:6; 48:12; 54:23; 60:3; 69:11; 70:16; 70:24; 75:22; 76:2; 78:11; 91:18; 97:15; 98:11; 99:10;
LOOKS [10] 9:6; 27:1; 27:23; 27:25; 37:16; 41:8; 44:2; 67:24; 68:3; 90:2;
LOSE [2] 12:17; 12:17;
LOST [2] 21:22; 78:23;
LOTS [1] 30:25;
LOUISE [1] 3:25;
LOWER [2] 21:12; 31:3;
LUXURY [1] 92:16;

=============

- M -

=============

M [1] 25:13;
MAIL [2] 43:20; 83:14;
MAILER [4] 83:14; 83:17; 85:7; 85:11;
MAILERS [1] 83:19;
MAILING [2] 83:15; 83:18;
MAIN [2] 44:20; 45:6;
MAJOR [4] 29:24; 45:24; 48:21; 97:16;
MAJORITY [1] 12:8;
MAKE-UP [1] 16:9;
MAKES [4] 24:17; 30:17; 66:13; 96:12;
MAKING [5] 6:4; 10:6; 36:16; 41:9; 69:13;
MANAGE [1] 66:16;
MANAGEMENT [2] 34:25; 53:9;
MANAGERS' [1] 3:2;
MAP [13] 18:21; 18:21; 20:9; 20:9; 21:5; 26:4; 26:5; 54:8; 64:7; 64:14; 64:19; 68:4; 76:9;
MAPPED [1] 18:19;
MAPS [6] 14:20; 26:19; 26:20; 34:25; 35:2; 37:8;
MARCHING [1] 38:12;
MARK [11] 3:12; 25:17; 27:24; 29:9; 29:21; 42:10; 64:24; 66:17; 80:9; 90:24; 93:22;
MARVIN [6] 3:9; 10:18; 10:21; 11:1; 11:9; 42:18;
MASS [4] 38:21; 38:21; 40:9; 40:10;
MATCH [1] 62:23;
MATERIAL [2] 38:16; 60:14;
MATERIALS [2] 72:2; 72:14;
MATRIX [1] 15:3;
MATTER [3] 73:24; 91:23; 97:21;
MAXIMIZE [2] 52:9; 60:15;
MAYER [2] 83:2; 83:3;
MCL [1] 25:14;
MCLS [3] 82:25; 98:12; 98:15;
MEAN [12] 16:3; 29:18; 35:24; 36:1; 37:6; 37:20; 53:18; 65:24; 85:23; 86:8; 90:17; 92:22;
MEANS [3] 37:9; 37:19; 62:2;
MEANT [2] 16:4; 16:23;
MEASURED [1] 41:2;
MEASUREMENTS [2] 69:12; 76:16;
MEET [3] 5:14; 95:8; 98:17;
MEETING [29] 3:2; 42:7; 43:12; 43:14; 43:21; 70:6; 75:17; 77:7; 77:14; 77:15; 82:2; 82:4; 82:14; 82:17; 82:18; 83:5; 83:8; 83:13; 84:3; 84:9; 84:20; 86:9; 86:18; 87:24; 92:22; 93:14; 93:25; 98:15; 99:15;
MEETINGS [4] 77:9; 77:9; 80:17; 85:9;
MEMORANDUM [4] 48:18; 50:3; 67:9; 76:22;
MENTIONED [3] 45:4; 45:16; 45:21;
MESH [2] 20:11; 20:15;
MET [2] 59:16; 77:4;
METER [1] 41:2;
METERED [1] 40:25;
METHOD [1] 39:2;
METHODS [1] 39:23;
MICROCOSM [1] 73:5;
MIDDLE [2] 5:19; 64:10;
MIDPOINT [1] 58:11;
MIDWAY [1] 24:21;
MIGHT [7] 4:6; 6:25; 14:2; 46:16; 60:1; 67:15; 79:15;
MIGRATION [1] 90:10;
MILLER [1] 73:9;
MILLIGRAMS [1] 27:3;
MILLION [1] 53:2;
MINE [1] 42:1;
MINUSCULE [1] 12:18;
MINUTES [1] 18:14;
MIX [3] 93:3; 93:12; 96:16;
MIZOTA [1] 3:25;
MLPU [1] 60:24;
MOD [1] 6:21;
MODE [1] 6:17;
MODEL [90] 4:12; 4:22; 6:5; 6:18; 7:6; 7:7; 7:10; 7:18; 8:5; 9:7; 11:25; 13:8; 13:10; 13:11; 15:5; 18:23; 19:8; 19:12; 19:14; 20:4; 20:6; 20:12; 21:2; 21:7; 21:8; 21:20; 21:22; 22:1; 22:3; 22:10; 22:13; 23:3; 23:8; 27:20; 28:3; 28:4; 28:18; 29:4; 29:14; 30:5; 30:12; 30:19; 37:3; 37:10; 37:21; 39:6; 40:20; 45:6; 45:15; 45:19; 45:21; 45:22; 50:20; 57:23; 57:24; 58:1; 58:5; 60:20; 60:24; 60:25; 61:11; 61:23; 62:3; 62:9; 62:9; 62:16; 63:2; 63:16; 65:13; 65:14; 65:15; 65:16; 65:16; 65:17; 66:11; 66:12; 66:13; 67:24; 76:4; 80:25; 86:24; 87:6; 87:9; 87:10; 87:18; 89:5; 89:24; 91:4; 91:6; 91:10;
MODELING [21] 4:9; 4:21; 11:5; 11:6; 19:10; 33:23; 42:24; 43:7; 44:11; 45:10; 45:17; 47:3; 47:22; 49:1; 49:14; 51:3; 61:8; 69:21; 71:5; 75:11; 78:13;
MODELS [3] 4:20; 17:19; 38:5;
MODFLOW [7] 8:14; 17:24; 19:12; 19:14; 29:23; 39:11; 39:20;
MOISTURE [1] 11:21;
MOLASSES [5] 73:10; 73:13; 74:15; 74:21; 90:12;
MOMENTARILY [1] 53:8;
MONDAY [5] 59:17; 76:5; 77:13; 77:16; 84:9;
MONEY [3] 78:1; 85:19; 93:4;
MONITOR [3] 22:17; 68:25; 70:21;
MONITORED [6] 54:11; 54:13; 62:11; 69:7; 70:18; 70:19;
MONITORING [32] 6:10; 19:25; 51:8; 51:18; 51:24; 52:15; 52:18; 53:10; 53:12; 53:16; 54:2; 54:6; 54:10; 54:15; 54:18; 54:18; 55:4; 56:20; 62:10; 62:21; 62:25; 64:2; 65:8; 67:7; 68:6; 68:8; 69:1; 69:6; 69:11; 70:17; 71:10; 73:22;
MONITORS [2] 84:18; 84:19;
MONK [1] 19:18;
MONTH [7] 15:15; 15:15; 70:8; 70:13; 88:23; 88:24; 93:18;
MONTHS [3] 12:3; 53:3; 91:11;
MORE [49] 4:9; 5:8; 5:22; 6:23; 7:1; 7:2; 7:21; 7:23; 8:16; 8:19; 9:21; 9:23; 9:24; 13:18; 13:25; 16:22; 17:6; 20:12; 22:18; 28:5; 30:23; 32:25; 34:1; 37:25; 39:10; 40:6; 43:12; 43:14; 44:21; 44:23; 47:5; 52:24; 53:2; 55:6; 55:24; 60:15; 66:13; 67:16; 69:14; 70:14; 74:14; 74:19; 78:18; 91:3; 92:2; 96:15; 98:12; 98:16; 99:6;
MOST [12] 17:24; 32:6; 35:16; 37:15; 44:15; 46:21; 47:3; 72:6; 73:7; 74:6; 75:6; 81:13;
MOSTLY [1] 48:22;
MOUND [1] 16:12;
MOUNDING [4] 14:16; 16:5; 16:14; 16:19;
MOUNTAIN [1] 38:7;
MOUNTAINS [2] 31:17; 31:21;
MOVE [1] 28:21;
MOVED [1] 24:20;

MOVEMENT [2] 26:11; 27:12;
MOVES [1] 27:15;
MOVING [5] 44:16; 77:12; 82:1; 92:14; 92:19;
MULTI [1] 58:3;
MULTI-LAYER [1] 60:25;
MULTI-PORT [7] 51:8; 51:25; 52:15; 53:17; 54:7; 54:25; 63:11;
MULTI-PORTS [1] 52:16;
MULTIPLE [3] 24:13; 26:6; 90:13;
MW-1 [1] 64:20;
MW-12 [1] 55:20;
MW-17 [1] 63:11;
MW-3 [4] 54:7; 54:23; 64:20; 91:24;
MW-4 [2] 54:7; 64:20;
MYSELF [1] 57:19;

=============

- N -

=============

NAME [3] 82:23; 83:1; 97:15;
NAMELY [3] 47:24; 50:21; 58:7;
NARRATE [1] 11:11;
NASA [17] 3:13; 42:14; 42:16; 65:6; 79:14; 79:15; 79:21; 80:1; 80:1; 82:2; 82:4; 82:5; 82:7; 82:16; 82:16; 95:4; 95:11;
NASA'S [2] 53:25; 78:25;
NASA/JET [1] 3:3;
NASA/JPL [7] 42:9; 45:11; 49:25; 50:6; 51:5; 53:24; 67:10;
NATIONAL [3] 10:8; 10:12; 10:13;
NATURAL [2] 33:7; 33:9;
NAVY [9] 3:9; 10:19; 11:2; 42:15; 42:16; 42:19; 50:1; 51:6; 67:10;
NAVY'S [1] 53:25;
NAVY/NASA [2] 3:8; 3:15;
NEAR [1] 64:7;
NEARLY [1] 12:8;
NECESSARILY [2] 8:12; 18:25;
NEEDED [1] 29:24;
NEEDS [3] 5:14; 46:11; 57:25;
NEGOTIATE [1] 95:20;
NEGOTIATIONS [1] 79:10;
NETWORK [2] 20:1; 70:17;
NEVER [3] 86:13; 87:14; 90:18;
NEW [9] 45:20; 59:21; 59:25; 72:25; 73:8; 73:12; 81:4; 81:11; 87:11;
NEWS [1] 84:2;
NEWSPAPER [1] 83:21;
NEWSPAPERS [2] 83:22; 83:24;
NEXT [11] 36:21; 46:16; 68:14; 69:23; 72:20; 75:16; 88:23; 93:14; 93:25; 94:1; 94:2;
NEZAFATI [68] 3:11; 11:17; 13:4; 14:2; 14:16; 14:24; 16:1; 16:4; 17:5; 17:8; 17:14; 18:12; 25:19; 28:7; 29:7; 29:19; 35:24; 36:3; 36:7; 36:13; 36:25; 37:13; 37:18; 38:3; 38:7; 39:3; 40:4; 40:11; 41:12; 41:15; 41:25; 42:3; 42:8; 42:12; 42:12; 44:25; 45:2; 56:11; 56:13; 56:22; 57:1; 57:10; 57:17; 59:2; 60:2; 60:12; 60:20; 61:17; 61:19; 61:23; 64:19; 65:3; 67:5; 67:19; 68:2; 68:10; 68:17; 68:21; 68:23; 81:6; 81:8; 81:20; 90:24; 91:16; 91:20; 95:14; 95:19; 95:24;
NICE [3] 4:19; 83:25; 85:17;
NO-FLOW [3] 31:5; 31:25; 33:1;
NOBODY [2] 66:14; 93:13;
NODES [1] 14:23;
NOMINALLY [1] 32:25;
NON-DEGRADATION [2] 98:8; 98:9;
NON-DEGREDATION [1] 99:5;
NON-TIME-CRITICAL [1] 75:8;
NONCONTAMINANTS [1] 99:4;
NONDESTRUCTIVE [1] 37:21;
NONLINEAR [1] 15:24;
NORTH [1] 32:9;
NORTHERN [2] 23:1; 31:8;
NORTHWEST [2] 32:11; 33:4;
NORTHWESTERN [1] 10:13;
NOTHING [3] 16:15; 61:12; 65:23;
NOTIFY [1] 85:2;
NOVEMBER [1] 44:8;
NUMBER [17] 5:10; 8:6; 8:10; 8:13; 33:15; 54:6; 69:6; 70:4; 70:7; 71:6; 71:7; 71:15; 75:5; 76:25; 81:5; 81:11; 83:12;
NUMERICAL [1] 4:10;
NUTSHELL [1] 95:21;

=============

- O -

=============

OBJECTIVES [2] 45:12; 45:15;
OBSERVATION [9] 51:14; 51:19; 52:18; 52:21; 52:25; 64:6; 65:18; 65:23; 66:3;
OBSERVED [6] 46:24; 62:14; 62:20; 62:24; 63:10; 64:1;
OBTAINING [2] 10:15; 47:1;
OBVIOUSLY [25] 4:4; 4:8; 5:9; 7:17; 10:15; 12:13; 13:18; 17:20; 19:3; 19:8; 19:22; 21:6; 28:5; 32:14; 35:18; 37:25; 38:21; 40:9; 40:14; 41:1; 67:12; 68:23; 88:19; 88:21; 92:6;
OCTOBER [4] 44:15; 58:16; 66:20; 89:20;
OFFICE [1] 77:17;
OFFICIAL [2] 96:12; 96:14;
OH [10] 16:25; 25:18; 36:3; 67:19; 86:4; 86:4; 86:10; 86:12; 91:10; 97:3;
OLD [2] 59:24; 87:10;
ONCE [4] 7:1; 15:11; 28:2; 75:17;
ONE [61] 5:7; 5:11; 5:13; 6:25; 7:17; 14:2; 17:17; 17:18; 19:14; 21:3; 21:5; 22:8; 22:14; 25:21; 26:14; 30:6; 37:14; 41:16; 43:14; 47:20; 48:21; 50:9; 51:1; 51:7; 52:14; 54:23; 55:1; 55:4; 63:6; 63:11; 72:4; 72:8; 72:25; 73:11; 74:7; 75:1; 76:9; 76:21; 77:1; 77:1; 77:10; 79:13; 80:6; 81:7; 85:2; 85:24; 86:19; 86:21; 88:9; 89:3; 92:21; 92:22; 94:4; 94:18; 94:19; 95:17; 96:4; 96:6; 97:7; 97:16; 98:20;
ONE-YEAR [1] 79:24;
ONES [11] 23:14; 35:19; 43:21; 62:20; 62:24; 68:13; 70:20; 74:4; 74:6; 74:20; 74:25;
ONGOING [2] 47:2; 71:2;
ONLY [22] 14:5; 33:14; 48:25; 54:12; 56:18; 59:5; 63:2; 63:19; 66:3; 66:4; 68:12; 69:5; 71:25; 75:20; 76:25; 77:1; 77:7; 77:7; 80:8; 80:19; 81:10; 83:23;
ONTO [1] 22:17;
OPEN [3] 18:8; 46:10; 79:10;
OPENING [1] 9:20;
OPERABLE [3] 4:21; 70:4; 79:25;
OPERATIONS [1] 70:11;
OPPORTUNITY [13] 5:25; 6:8; 7:23; 8:15; 17:25; 29:8; 53:6; 65:4; 65:6; 65:10; 67:2; 69:18; 78:24;
OPTION [13] 15:20; 25:7; 25:9; 26:3; 51:7; 51:23; 52:1; 52:6; 52:14; 52:22; 52:23; 69:5; 93:2;
OPTIONS [9] 9:3; 24:3; 24:4; 27:10; 46:11; 50:11; 51:6; 79:24; 93:11;
ORDER [5] 50:11; 53:3; 53:9; 58:25; 59:14;
ORIGINAL [1] 59:23;
ORIGINALLY [2] 30:23; 70:18;
OTHERS [1] 13:10;
OTHERWISE [1] 66:1;
OU [1] 71:15;
OU-1 [4] 43:6; 43:7; 44:10; 44:22;
OU-2 [3] 43:13; 44:1; 44:9;
OURSELVES [1] 42:5;
OUTER [1] 21:16;
OUTLINE [3] 18:5; 18:6; 18:18;
OUTPUT [3] 36:8; 40:16; 40:17;
OUTSIDE [4] 5:5; 7:13; 10:17; 35:2;
OVERALL [1] 43:9;
OVERHEAD [2] 5:23; 39:18;
OVERLAY [3] 19:11; 26:19; 27:9;
OVERLAYING [1] 26:4;
OVERVIEW [3] 9:8; 42:23; 43:9;

=============

- P -

=============

PACIFIC [1] 10:13;
PACKAGE [1] 76:3;
PACKED [3] 71:14; 74:3; 74:4;
PACKING [2] 72:2; 72:14;
PAGE [1] 84:1;
PAINSTAKING [1] 91:11;
PAPER [2] 84:2; 86:1;
PARALLEL [3] 15:6; 48:6; 48:12;
PARAMETER [1] 72:13;
PARAMETERS [14] 50:15; 50:19; 50:20; 50:21; 50:22; 51:13; 52:11; 52:12; 58:6; 58:9; 58:14; 62:7; 63:21; 65:12;
PARED [1] 8:12;
PARING [1] 8:9;
PART [14] 30:18; 30:25; 32:1; 46:13; 68:12; 70:3; 75:6; 76:3; 76:19; 78:20; 79:13; 80:2; 87:8; 87:13;
PARTIALLY [1] 56:3;
PARTICIPATED [1] 30:19;
PARTICLE [8] 22:11; 23:6; 23:17; 23:18; 23:19; 24:2; 24:6; 26:1;
PARTICLES [6] 24:6; 24:7; 24:23; 25:2; 25:14; 26:12;
PARTICULAR [21] 7:3; 8:25; 20:17; 23:25; 24:8; 24:9; 24:15; 24:24; 26:13; 26:17; 26:23; 27:15; 38:1; 39:16; 39:25; 46:2; 49:12; 55:8; 55:14; 58:3; 89:1;
PARTICULARLY [11] 8:20; 10:9; 18:14; 20:13; 27:19; 32:5; 39:12; 39:13; 47:3; 49:17; 85:4;
PASADENA [21] 4:1; 48:2; 48:23; 49:18; 50:1; 53:23; 56:15; 56:23; 57:6; 61:20; 76:6; 79:8; 84:2; 85:4; 85:16; 85:21; 85:23; 86:3; 86:15; 95:9; 98:1;
PASSES [1] 28:13;
PAST [4] 39:25; 51:2; 79:11; 79:16;
PATH [1] 26:7;
PATHS [1] 24:13;
PAVED [1] 34:9;
PAYING [1] 79:21;
PEOPLE [7] 6:21; 6:23; 17:10; 78:21; 84:15; 85:2; 93:20;
PER [2] 27:3; 35:21;
PERCENT [1] 13:9;
PERCHLORATE [15] 46:2; 46:15; 46:18; 48:9; 72:12; 72:25; 73:3; 75:14; 82:13; 82:21; 82:21; 82:25; 83:7; 93:8; 96:8;
PERCOLATION [1] 33:9;
PERFECTLY [1] 27:25;
PERFORM [7] 50:9; 50:11; 51:9; 52:3; 52:5; 53:10; 66:16;
PERFORMED [1] 50:2;
PERFORMING [3] 45:25; 50:18; 51:4;
PERIOD [4] 35:13; 35:14; 36:24; 57:2;
PERIODICALLY [1] 54:13;
PERIODS [2] 37:22; 69:9;
PERMEABLE [1] 13:17;
PERSON [2] 9:13; 97:13;
PETER [4] 3:13; 42:9; 77:10; 91:2;
PHASE [3] 36:15; 38:17; 69:15;
PHONE [2] 10:23; 42:17;
PHOTO [1] 18:21;
PHYSIOGRAPHIC [1] 30:11;
PICKED [2] 53:20; 54:9;
PICKING [1] 69:15;
PICTURE [1] 25:1;
PIECE [1] 85:17;
PIECES [1] 47:14;
PILOT [9] 44:5; 70:11; 70:12; 70:22; 71:7; 71:8; 71:14; 72:21; 75:4;
PINCH [1] 31:3;
PINK [1] 54:25;
PINNING [1] 87:7;
PIPELINE [1] 92:7;
PIT [1] 22:7;
PLACE [3] 70:23; 90:5; 93:24;
PLACEMENT [2] 90:21; 91:12;
PLACES [1] 10:8;
PLACING [3] 89:24; 90:1; 90:21;
PLAN [7] 48:18; 53:24; 69:6; 71:3; 78:20; 98:11; 99:8;
PLANNED [1] 73:21;
PLANNING [2] 36:25; 72:22;
PLANT [1] 79:6;
PLAYS [1] 92:6;
PLUME [12] 25:12; 25:15; 25:15; 25:23; 27:1; 27:8; 27:11; 37:8; 75:22; 75:25; 90:10; 96:10;

PLUMES [1] 37:4;
PLUS [2] 34:25; 82:15;
POINT [14] 5:17; 8:16; 9:5; 9:14; 11:4; 19:4; 19:6; 32:22; 36:11; 44:2; 70:3; 70:14; 71:13; 87:19;
POINTED [1] 51:3;
POINTS [4] 25:8; 25:10; 25:11; 31:23;
POISONING [1] 86:6;
POLE [1] 28:11;
POLICIES [1] 46:5;
POLICY [4] 46:5; 48:13; 97:1; 98:15;
POLYGON [2] 25:11; 25:11;
POND [1] 22:8;
POOR [1] 5:23;
POP [1] 24:17;
POPULAR [2] 9:22; 9:24;
POPULARITY [1] 39:22;
POPULATIONS [1] 34:14;
PORT [3] 55:23; 58:2; 58:3;
PORTION [9] 11:25; 12:7; 22:25; 23:1; 33:12; 49:5; 49:22; 66:4; 66:5;
PORTIONS [1] 32:16;
POSSIBLE [8] 8:13; 25:23; 76:2; 77:22; 77:23; 81:25; 93:8; 95:3;
POSSIBLY [4] 30:24; 92:24; 93:2; 96:16;
POST-PROCESSING [1] 9:11;
POST-PROCESSORS [1] 17:25;
POTENTIAL [1] 76:17;
POTENTIALLY [2] 46:9; 47:25;
POWER [2] 96:1; 96:15;
POWERFUL [2] 17:20; 28:23;
PRACTICALLY [1] 57:11;
PRE-PROCESSORS [1] 17:24;
PRECIPITATION [3] 12:14; 12:25; 33:7;
PRECISELY [2] 6:9; 6:15;
PREDICTS [3] 62:10; 65:17; 65:17;
PREFERABLE [1] 5:13;
PRELIMINARY [2] 63:7; 63:14;
PREPARATION [1] 47:8;
PREPARE [1] 20:4;
PREPARED [2] 45:16; 48:16;
PREPROCESSING [1] 15:10;
PRESENT [4] 8:12; 28:13; 53:24; 77:21;
PRESENTATION [5] 11:6; 28:8; 29:12; 41:24; 98:18;
PRESENTING [2] 50:6; 67:9;
PRESENTLY [1] 4:20;
PRESSING [1] 95:6;
PRESSURE [1] 34:20;
PRETTY [11] 4:25; 8:8; 12:22; 26:2; 26:23; 68:8; 77:17; 80:14; 84:21; 86:25; 87:25;
PREVIOUS [2] 45:10; 46:19;
PREVIOUSLY [1] 19:14;
PROBABLY [15] 6:21; 10:4; 24:21; 28:22; 43:5; 43:20; 44:4; 68:15; 75:16; 84:4; 84:5; 87:6; 88:23; 89:7; 89:8;
PROBLEM [9] 7:4; 22:4; 40:1; 40:3; 41:7; 74:12; 97:25; 99:8; 99:10;
PROBLEMS [4] 6:14; 8:18; 8:18; 96:5;
PROCESS [4] 7:22; 8:23; 22:1; 75:8;
PRODUCING [1] 59:10;
PRODUCTION [40] 4:5; 4:14; 5:10; 5:19; 6:3; 6:11; 6:12; 13:14; 13:19; 19:25; 20:14; 20:16; 20:18; 22:6; 23:15; 30:22; 35:4; 39:16; 41:1; 48:22; 49:2; 49:3; 49:6; 49:7; 49:17; 49:18; 49:22; 53:7; 53:13; 53:22; 56:19; 58:25; 59:5; 59:13; 60:18; 65:7; 65:22; 69:10; 77:20; 92:13;
PROFESSIONAL [1] 29:20;
PROFESSIONALS [3] 29:10; 29:17; 81:18;
PROGRAM [1] 33:13;
PROGRAMS [1] 8:7;
PROGRESS [1] 29:13;
PROJECT [8] 3:2; 10:4; 29:10; 42:23; 43:9; 45:5; 81:17; 81:23;
PROJECTED [1] 46:24;
PROPERLY [1] 52:2;
PROPERTIES [2] 18:2; 38:17;
PROPERTY [2] 78:11; 98:5;
PROPORTIONING [1] 49:15;
PROPORTIONS [1] 61:8;
PROPOSED [1] 95:12;
PROPOSING [1] 76:8;
PROPULSION [1] 3:3;
PUBLIC [13] 28:13; 43:14; 43:21; 70:6; 83:12; 83:16; 84:3; 84:7; 84:9; 84:20; 86:8; 86:18; 87:23;
PULLED [1] 49:12;
PUMP [2] 13:18; 87:9;
PUMPING [28] 47:25; 50:10; 50:11; 50:13; 51:4; 51:17; 51:21; 52:17; 53:19; 53:19; 53:22; 55:6; 55:15; 56:12; 56:13; 57:1; 60:25; 61:1; 65:19; 65:20; 65:21; 66:15; 66:16; 67:22; 69:10; 87:12; 89:13; 98:13;
PUMPS [2] 54:14; 54:17;
PURPOSES [9] 38:10; 44:3; 45:23; 49:1; 50:16; 50:17; 61:1; 69:21; 69:22;
PURVEYORS [2] 53:23; 96:1;
PUSH [1] 81:24;
PUSHING [2] 88:13; 92:17;
PUTTING [4] 48:8; 52:24; 75:11; 85:11;

=============

- Q -

=============

QUALITATIVE [1] 8:19;
QUALITY [5] 31:19; 31:20; 49:9; 49:11; 97:14;
QUESTIONS [6] 11:15; 27:21; 56:10; 67:15; 67:20; 69:25;
QUICK [4] 9:12; 18:8; 80:21; 83:12;
QUICKER [2] 24:11; 75:9;
QUICKLY [16] 7:19; 18:7; 21:1; 22:12; 23:4; 23:16; 24:5; 24:14; 25:25; 26:21; 26:24; 43:10; 52:14; 81:24; 93:7; 95:7;
QUITE [7] 10:5; 16:9; 26:14; 53:1; 63:20; 95:22; 96:18;

=============

- R -

=============

RADIO [2] 84:8; 84:11;
RADIUS [1] 74:23;
RAISE [1] 80:13;
RAN [3] 15:20; 15:22; 23:5;
RANGE [1] 32:15;
RAPIDLY [1] 13:1;
RATE [7] 16:10; 49:5; 49:15; 49:21; 49:23; 61:3; 61:9;
RATES [3] 33:18; 57:8; 72:15;
RATHER [8] 4:11; 13:1; 14:18; 14:22; 30:15; 39:1; 45:20; 92:11;
RATIO [4] 49:10; 50:22; 50:23; 63:4;
RATIOS [1] 58:9;
RAYMOND [14] 17:11; 30:8; 31:13; 31:16; 31:17; 31:18; 34:24; 34:24; 53:9; 66:20; 84:24; 84:25; 96:13; 97:22;
REACH [1] 16:8;
REACHES [3] 12:10; 12:14; 15:15;
REACHING [2] 23:21; 35:22;
REACTION [1] 92:2;
REACTIVATE [1] 46:10;
REACTOR [4] 71:14; 74:3; 74:4; 74:9;
REACTORS [3] 72:1; 72:7; 72:15;
READ [2] 17:10; 88:3;
READILY [1] 40:15;
READY [4] 54:17; 66:22; 83:13; 88:17;
REAL [20] 9:8; 9:12; 13:17; 18:7; 18:8; 22:3; 25:25; 26:21; 40:25; 57:22; 62:11; 63:16; 65:4; 65:25; 65:25; 80:21; 88:18; 88:19; 95:5; 99:10;
REALIZE [1] 11:10;
REALIZED [1] 65:5;
REALLY [37] 6:1; 6:14; 7:2; 8:24; 9:20; 10:5; 14:16; 16:15; 17:20; 21:1; 22:17; 26:3; 30:6; 30:10; 32:6; 39:8; 39:20; 41:3; 56:22; 58:21; 65:6; 65:24; 68:5; 68:25; 70:13; 72:10; 77:3; 77:6; 77:7; 81:22; 88:6; 89:2; 91:2; 91:18; 96:13; 97:21; 98:22;
REALTY [1] 38:25;
REASON [2] 80:8; 83:23;
REASONABLE [1] 92:10;
REASONABLY [3] 15:1; 37:16; 38:25;
REASONS [2] 30:25; 92:9;
REASSIGN [1] 13:11;
REASSIGNS [1] 4:16;
RECEIVE [2] 87:14; 87:21;
RECEIVED [3] 43:21; 72:4; 88:12;
RECEIVING [1] 87:11;
RECENT [3] 35:15; 35:16; 46:22;
RECENTLY [1] 59:20;
RECHARGE [7] 31:24; 33:7; 33:9; 33:10; 34:7; 34:11; 40:21;
RECOMMENDATION [1] 4:25;
RECONFIGURING [2] 72:1; 72:16;
RECORD [7] 5:5; 7:13; 10:17; 17:7; 43:25; 79:25; 80:2;
RECORDED [2] 41:3; 54:19;
RECORDS [1] 38:18;
RED [2] 63:9; 63:24;
REDUCE [1] 72:11;
REDUCING [1] 65:12;
REDUCTION [2] 73:22; 75:14;
REFLECT [1] 57:3;
REFRESH [1] 18:7;
REGARDING [1] 67:22;
REGIONAL [10] 17:15; 31:19; 45:9; 95:25; 96:2; 96:11; 96:21; 96:25; 97:6; 97:14;
REGULAR [2] 71:9; 86:2;
REGULATORY [4] 46:9; 51:2; 67:10; 81:3;
REINFILTRATE [1] 98:2;
REINJECT [3] 96:22; 97:4; 98:2;
REINJECTING [3] 96:7; 96:9; 98:24;
REINJECTION [6] 76:1; 97:17; 97:18; 97:24; 98:6; 99:9;
RELATE [1] 18:1;
RELATION [1] 46:7;
RELATIVE [1] 13:15;
RELEASE [2] 25:10; 25:11;
RELEASES [1] 25:8;
RELEASING [1] 24:6;
REMEDIAL [3] 3:2; 48:18; 95:20;
REMEDIATION [4] 79:2; 82:11; 90:11; 96:3;
REMEDIES [1] 85:12;
REMEDY [1] 48:19;
REMEMBER [2] 82:23; 97:15;
REMOVAL [4] 75:8; 76:23; 77:24; 82:1;
REMOVE [1] 59:1;
REPLACED [1] 10:11;
REPLACEMENT [5] 76:2; 78:11; 78:14; 78:17; 79:3;
REPLACING [2] 77:6; 87:9;
REPORT [1] 45:3;
REPORTED [1] 3:25;
REPORTER [2] 5:4; 41:16;
REPRESENT [2] 5:14; 6:18;
REPRESENTING [1] 19:9;
REPRESENTS [6] 18:23; 20:22; 30:10; 34:22; 35:5; 35:7;
REQUIREMENTS [1] 46:9;
RESIDENTIAL [1] 34:12;
RESLEEVED [3] 59:19; 92:23; 92:24;
RESOLUTION [1] 5:20;
RESOLVE [2] 39:18; 98:19;
RESPECT [1] 62:14;
RESPOND [1] 53:18;
RESPONDING [1] 43:22;
RESPONSE [8] 51:18; 55:4; 55:17; 55:24; 57:20; 62:11; 70:22; 72:17;
RESPONSES [1] 43:24;
RESPONSIBLE [1] 14:17;
RESPONSIVENESS [2] 43:17; 70:8;
RESTARTING [1] 72:19;
RESTORATIVITY [2] 50:22; 58:9;
RESULT [5] 38:14; 41:19; 41:20; 63:14; 63:22;
RESULTS [15] 7:21; 21:20; 23:5; 39:9; 41:14; 41:15; 48:17; 54:22; 66:12; 66:13; 66:24; 67:7; 72:4; 72:8; 75:10;
RETURN [2] 33:15; 34:17;

REUPPED [1] 81:10;
REVERSAL [6] 14:18; 14:18; 16:24; 17:3; 17:3; 17:9;
REVERSALS [1] 16:3;
REVERSE [1] 16:18;
REVIEW [3] 44:6; 44:17; 44:18;
REVIEWED [3] 35:1; 45:8; 52:14;
REVIEWING [4] 45:13; 53:17; 56:18; 69:9;
RI [3] 14:21; 61:21; 70:19;
RICHARD [8] 3:15; 10:21; 10:22; 42:14; 43:18; 67:13; 77:3; 88:8;
RICHARD'S [1] 95:4;
RIPPERDA [105] 3:12; 5:2; 9:16; 10:2; 11:15; 11:18; 11:23; 12:2; 12:22; 12:24; 13:5; 13:8; 14:1; 14:15; 14:22; 15:3; 15:22; 16:25; 17:2; 25:4; 25:18; 27:23; 27:25; 28:14; 29:17; 30:17; 31:2; 31:7; 31:10; 31:23; 32:10; 33:3; 33:17; 34:19; 35:10; 35:19; 36:1; 36:4; 36:8; 36:23; 37:12; 37:14; 38:2; 38:4; 38:20; 38:25; 40:7; 40:12; 41:6; 42:10; 42:10; 56:10; 56:12; 56:21; 56:24; 57:5; 57:16; 58:17; 60:5; 60:17; 61:15; 61:22; 64:9; 64:16; 68:1; 68:7; 70:1; 74:2; 75:20; 78:1; 78:6; 78:9; 79:13; 80:10; 83:2; 85:6; 85:16; 85:22; 86:1; 86:5; 86:10; 86:24; 87:3; 87:23; 88:3; 88:6; 88:16; 89:19; 89:22; 91:9; 91:18; 91:21; 92:1; 93:21; 94:1; 94:16; 94:21; 95:13; 95:15; 96:18; 96:25; 97:3; 97:6; 97:8; 99:12;
RISE [2] 4:12; 19:19;
RISES [1] 30:9;
RISING [2] 19:3; 40:19;
RIVER [1] 23:2;
ROAD [3] 39:21; 69:21; 90:9;
ROADS [1] 20:10;
ROBLES [60] 3:13; 7:11; 11:3; 16:2; 17:7; 17:9; 17:15; 25:17; 25:20; 27:24; 28:1; 28:8; 28:17; 29:21; 38:18; 39:2; 39:10; 40:2; 41:22; 42:4; 42:9; 42:9; 42:20; 42:22; 43:3; 64:12; 64:24; 69:23; 78:3; 78:7; 78:10; 78:20; 79:6; 79:15; 79:19; 82:2; 84:23; 85:2; 85:4; 85:21; 85:23; 87:2; 92:20; 93:13; 93:17; 93:22; 94:4; 94:6; 94:8; 94:11; 94:13; 94:17; 94:19; 94:22; 94:24; 95:2; 97:7; 97:12; 99:2; 99:14;
ROBUST [2] 7:3; 39:20;
ROD [3] 44:4; 44:8; 70:9;
ROLLING [1] 89:9;
ROUGHLY [1] 15:13;
ROUND [1] 82:11;
RPM [2] 75:16; 94:17;
RPMS [4] 28:8; 43:18; 44:17; 98:19;
RUN [16] 15:23; 23:8; 35:11; 35:12; 35:18; 35:19; 36:9; 36:17; 36:23; 37:15; 37:22; 38:5; 58:17; 62:8; 87:5; 90:4;
RUNNING [6] 6:14; 37:3; 38:11; 84:11; 88:17; 88:19;
RUNS [5] 32:21; 32:22; 33:20; 35:10; 63:15;

============

- S -

============

SACRAMENTO [1] 96:6;
SAME [15] 6:13; 26:8; 41:18; 44:12; 51:15; 57:8; 57:12; 60:20; 66:19; 66:21; 67:5; 81:10; 93:24; 93:24; 95:18;
SAMPLE [1] 8:18;
SAMPLES [1] 49:9;
SANITARY [1] 71:22;
SANITATION [2] 71:20; 71:22;
SANTA [4] 28:15; 28:17; 29:4; 29:16;
SATURATED [9] 11:25; 12:6; 12:7; 14:5; 15:21; 19:7; 19:9; 30:4; 32:25;
SAVE [2] 24:4; 93:3;
SAW [2] 80:19; 91:9;
SAYING [4] 33:23; 89:8; 93:6; 96:22;
SCALE [7] 16:15; 51:4; 52:10; 65:23; 65:24; 66:15; 74:16;
SCENARIO [1] 91:22;
SCENARIOS [4] 27:16; 35:18; 88:25; 89:13;
SCHEDULE [9] 42:23; 43:6; 44:1; 44:19; 59:5; 59:14; 88:22; 91:1; 92:13;
SCHEDULING [1] 44:3;
SCREEN [10] 22:19; 54:25; 55:1; 55:1; 55:2; 55:5; 55:18; 55:24; 59:23; 63:25;
SCREENED [7] 49:8; 49:18; 51:14; 60:9; 60:9; 60:12; 61:16;
SCREENING [2] 8:7; 51:11;
SCREENS [6] 55:16; 59:19; 59:22; 59:24; 59:25; 63:12;
SCROLL [1] 22:17;
SCRUTINY [1] 28:13;
SE [1] 35:21;
SECO [2] 32:5; 32:8;
SECOND [9] 5:2; 7:11; 10:4; 26:8; 31:4; 50:8; 52:1; 94:13; 94:15;
SECTION [2] 84:1; 84:1;
SEDIMENTS [1] 12:19;
SEEING [10] 14:19; 27:22; 33:24; 33:25; 55:5; 55:7; 55:19; 59:15; 60:8; 74:23;
SEEM [2] 72:11; 97:25;
SEEMED [1] 30:3;
SEEMS [1] 40:14;
SEEN [3] 37:8; 65:18; 86:13;
SEEPAGE [1] 22:7;
SELECT [3] 24:14; 26:9; 73:24;
SELECTED [2] 27:19; 48:19;
SELECTING [1] 73:14;
SELECTION [1] 4:22;
SENATE [1] 81:9;
SENIOR [1] 67:23;
SENSE [5] 4:6; 30:17; 62:1; 92:4; 98:20;
SENSITIVE [5] 17:5; 53:21; 55:6; 55:18; 69:14;
SENT [1] 84:15;
SEPARATE [3] 14:7; 15:5; 60:24;
SEPTEMBER [8] 44:13; 79:11; 80:4; 93:15; 93:16; 93:17; 93:17; 93:24;
SEQUENTIALLY [1] 27:15;
SERIES [1] 69:12;
SERVER [1] 18:11;
SERVICE [1] 84:7;
SERVICES [1] 82:15;
SET [9] 24:3; 25:7; 25:8; 25:9; 25:14; 25:14; 27:2; 35:18; 45:11;
SETTLED [1] 78:18;
SEVERAL [3] 9:8; 12:3; 84:19;
SEWAGE [1] 33:16;
SEWER [1] 71:22;
SEWERING [1] 33:13;
SHALLOW [4] 13:4; 24:16; 52:18; 54:6;
SHALLOWER [1] 55:16;
SHIFTED [1] 15:17;
SHOOT [1] 93:23;
SHORTLY [2] 47:8; 75:19;
SHOW [7] 9:6; 9:7; 21:1; 21:25; 28:5; 55:17; 60:1;
SHOWED [3] 22:21; 64:15; 76:9;
SHOWING [5] 18:4; 18:21; 20:8; 21:4; 84:19;
SHOWN [1] 19:24;
SHOWS [9] 47:17; 47:18; 54:21; 55:9; 55:13; 55:21; 55:24; 57:20; 63:15;
SHUT [8] 18:7; 54:14; 59:12; 70:12; 70:15; 71:8; 71:15; 71:25;
SHUTS [1] 66:21;
SIDE [5] 19:7; 21:15; 30:10; 40:17; 83:4;
SIDES [1] 19:4;
SIGNIFICANT [3] 8:10; 19:19; 33:11;
SIGNIFICANTLY [3] 4:9; 32:25; 34:11;
SIMILAR [3] 55:21; 74:8; 74:9;
SIMILARLY [1] 6:8;
SIMPLE [2] 6:20; 7:1;
SIMULATE [2] 14:25; 20:24;
SIMULATED [4] 62:13; 62:19; 62:24; 63:22;
SIMULATING [2] 11:24; 12:7;
SIMULATION [3] 15:20; 41:10; 41:20;
SIMULATIONS [6] 12:1; 23:12; 28:6; 39:7; 89:12; 89:12;
SINCE [9] 24:16; 40:7; 52:13; 72:12; 76:25; 79:21; 84:3; 85:16; 91:12;
SINGLE [3] 24:13; 75:21; 75:23;
SITE [41] 5:9; 5:14; 5:18; 8:22; 9:1; 10:9; 10:10; 18:11; 18:22; 20:1; 21:13; 22:25; 39:14; 45:4; 45:7; 45:12; 45:22; 47:7; 47:10; 47:13; 47:21; 48:19; 51:9; 51:25; 53:16; 56:17; 64:8; 64:19; 66:16; 70:16; 70:17; 73:23; 74:7; 75:25; 77:22; 77:23; 84:16; 85:13; 88:21; 92:25; 98:4;
SITE-SPECIFIC [1] 45:8;
SITES [11] 23:13; 23:13; 76:8; 76:10; 76:10; 76:11; 76:16; 76:17; 76:18; 77:21; 96:6;
SITTING [1] 31:4;
SITUATION [4] 6:13; 22:5; 52:8; 66:1;
SIX [2] 53:3; 87:6;
SIZE [3] 17:3; 23:11; 96:9;
SLEEVE [2] 59:21; 59:22;
SLIDES [2] 7:14; 54:21;
SLOPE [1] 21:9;
SLOPES [2] 21:13; 30:9;
SMALLER [2] 33:14; 66:4;
SOFTWARE [2] 8:4; 26:18;
SOIL [5] 30:4; 30:4; 70:17; 71:1; 71:10;
SOLID [4] 63:13; 63:18; 63:23; 63:24;
SOLUTE [4] 23:7; 26:22; 37:10; 45:23;
SOLUTION [3] 15:3; 62:2; 63:1;
SOLVING [1] 15:24;
SOMETIME [3] 44:5; 44:8; 44:14;
SOMETIMES [1] 98:12;
SOMEWHAT [2] 15:16; 92:8;
SOON [1] 95:3;
SOPHISTICATED [1] 9:4;
SORRY [1] 56:11;
SORT [26] 5:16; 8:19; 15:8; 15:10; 16:19; 18:5; 18:18; 20:21; 21:9; 21:16; 23:24; 24:11; 26:15; 27:18; 32:22; 34:14; 34:22; 35:17; 36:14; 36:15; 38:14; 47:12; 47:16; 49:14; 54:8; 92:6;
SORTS [2] 21:19; 25:8;
SOUND [1] 93:19;
SOURCE [6] 14:22; 15:6; 23:9; 27:2; 33:5; 73:21;
SOURCES [8] 4:5; 22:7; 23:11; 24:9; 32:3; 33:6; 34:5; 40:8;
SOUTHERN [1] 22:25;
SOUTHWEST [5] 3:9; 10:19; 11:1; 31:9; 42:18;
SOUTHWESTERN [1] 31:8;
SPACING [1] 6:10;
SPATIAL [1] 92:5;
SPATIALLY [1] 17:23;
SPEAKER [1] 10:23;
SPECIFIC [6] 5:8; 44:23; 45:11; 50:19; 51:12; 88:1;
SPECIFICALLY [5] 6:1; 20:15; 37:4; 82:21; 98:22;
SPECIFICS [1] 95:24;
SPEED [1] 8:20;
SPEEDING [1] 7:22;
SPEND [2] 7:23; 8:17;
SPENT [1] 39:23;
SPINNER [7] 58:18; 58:22; 58:22; 59:1; 59:25; 60:6; 61:13;
SPINNER-LOGGING [8] 48:1; 48:22; 48:24; 61:4; 61:13; 77:23; 92:9; 92:12;
SPREAD [1] 41:5;
SPREADING [4] 14:11; 16:6; 16:16; 16:24;
STAGE [1] 47:13;
STAND [1] 44:25;
STANDPOINT [2] 59:6; 79:1;
STAR [4] 84:2; 85:23; 86:3; 86:16;
START [10] 6:14; 26:6; 42:1; 42:4; 42:8; 42:8; 42:22; 59:15; 88:24; 90:9;

STARTED [8] 26:12; 45:5; 54:14; 87:1; 87:2; 87:3; 87:4; 87:18;
STARTING [6] 8:5; 24:24; 25:2; 25:13; 47:8; 47:22;
STARTS [1] 13:18;
STATE [10] 9:7; 31:19; 35:22; 36:5; 36:17; 38:12; 38:13; 38:14; 38:23; 83:6;
STATES [1] 9:24;
STATIC [2] 53:10; 54:16;
STATIONS [2] 84:8; 84:12;
STATUS [6] 45:3; 71:24; 75:3; 75:6; 81:23; 82:24;
STEADY [7] 35:22; 36:5; 36:17; 38:12; 38:13; 38:14; 38:23;
STEAM [1] 88:13;
STEEPLY [1] 19:3;
STEP [5] 13:21; 36:21; 36:22; 62:18; 64:4;
STEPS [1] 60:19;
STILL [9] 70:21; 71:17; 72:21; 73:20; 80:6; 87:6; 97:8; 97:10; 97:12;
STIMULATE [1] 73:3;
STIMULATING [1] 73:18;
STOP [1] 92:14;
STORAGE [2] 11:19; 63:3;
STORY [1] 75:19;
STRAIGHT [1] 21:17;
STREETS [1] 33:15;
STRENGTH [1] 23:10;
STRICTER [1] 98:16;
STRINGENT [1] 98:12;
STRIPPING [1] 79:5;
STRONG [2] 30:10; 30:11;
STRONGER [1] 30:12;
STUDIES [3] 32:18; 71:7; 75:4;
STUDY [9] 44:5; 70:11; 70:12; 70:22; 71:2; 71:8; 71:14; 72:21; 73:12;
STUFF [4] 10:14; 15:10; 28:25; 93:10;
SUBCONTRACTORS [1] 54:1;
SUBMIT [1] 70:25;
SUBMITTED [1] 71:4;
SUBMITTING [6] 43:18; 43:22; 43:24; 44:17; 67:4; 75:18;
SUBSEQUENT [2] 77:9; 77:9;
SUBSURFACE [1] 73:2;
SUCCESSFUL [2] 72:6; 72:7;
SUCH [5] 39:14; 46:5; 63:21; 82:16; 85:17;
SUFFERING [1] 6:4;
SUGGEST [1] 41:25;
SUIT [1] 40:1;
SUITABLE [1] 27:25;
SUITE [1] 73:6;
SUITED [1] 52:17;
SUITS [1] 40:3;
SULFATE [1] 98:23;
SUMMARIZED [1] 45:18;
SUMMARIZES [1] 50:4;
SUMMARIZING [1] 48:17;
SUMMARY [2] 43:17; 70:8;
SUPERFUND [1] 10:10;
SUPPORT [1] 47:2;
SUPPORTING [4] 37:19; 47:21; 80:7; 90:23;
SUPPORTIVE [2] 82:9; 95:11;
SUPPOSED [1] 89:14;
SURE [26] 5:3; 7:12; 10:6; 25:22; 25:24; 28:17; 36:2; 36:16; 38:6; 38:23; 41:9; 42:2; 43:23; 45:1; 54:15; 67:1; 67:14; 69:21; 73:16; 73:24; 77:11; 77:19; 78:13; 87:20; 91:25; 98:3;
SURFACE [7] 12:10; 19:17; 21:13; 21:18; 24:18; 32:6; 32:7;
SUSTAINED [1] 32:23;
SUSTAINS [1] 36:16;
SVE [1] 71:8;
SYSTEM [11] 71:18; 71:21; 74:1; 74:1; 74:17; 81:25; 90:4; 90:7; 91:22; 92:25; 98:7;
SYSTEMS [1] 96:3;
============
- T -
============
T [1] 61:5;
TABLE [12] 4:7; 11:19; 11:20; 12:11; 12:15; 13:1; 13:23; 15:19; 19:5; 19:5; 19:20; 82:11;
TABLES [1] 4:11;
TAKARA [1] 76:7;
TAKE [11] 5:2; 13:8; 13:25; 15:25; 28:9; 36:21; 46:8; 52:3; 53:3; 75:18; 88:17;
TAKES [2] 18:12; 61:24;
TAKING [3] 35:15; 47:12; 49:8;
TALK [6] 5:7; 16:22; 17:6; 43:10; 82:17; 82:24;
TALKED [3] 49:1; 50:1; 81:3;
TALKING [11] 30:2; 31:18; 47:4; 49:14; 71:19; 78:1; 86:23; 90:20; 97:8; 97:13; 97:24;
TANGIBLE [1] 39:5;
TAPE [1] 80:21;
TARGETING [1] 60:15;
TASK [2] 45:6; 45:24;
TASKED [1] 80:24;
TDS [1] 98:23;
TECH [6] 79:8; 79:9; 79:14; 79:21; 79:22; 84:14;
TECHNICAL [7] 29:13; 45:13; 45:18; 46:13; 47:15; 47:18; 67:8;
TECHNOLOGIES [7] 46:1; 46:3; 48:7; 75:13; 81:2; 82:11; 82:12;
TEETH [1] 96:15;
TELECOM [1] 94:17;
TELEPHONE [2] 3:10; 10:16;
TELL [1] 64:17;
TELLING [1] 98:4;
TELLS [3] 49:4; 62:15; 63:19;
TENT [1] 28:11;
TERM [2] 35:19; 92:11;
TERMED [1] 4:18;
TEST [27] 8:18; 50:5; 50:10; 50:12; 50:14; 51:9; 51:10; 51:21; 52:3; 52:5; 52:17; 60:1; 61:1; 65:16; 65:19; 65:20; 65:21; 66:4; 66:6; 66:15; 66:16; 68:12; 68:14; 72:5; 72:8; 72:13; 87:9;
TESTING [6] 49:9; 50:2; 52:2; 61:13; 61:14; 67:23;
TESTS [11] 47:25; 50:13; 50:18; 51:5; 58:18; 58:22; 59:1; 60:6; 72:11; 73:5; 87:12;
TEXTURE [1] 16:9;
THAN [10] 14:22; 28:5; 30:15; 32:25; 34:2; 39:1; 39:11; 92:11; 98:6; 98:12;
THANKS [1] 44:25;
THEMSELVES [1] 7:6;
THERE'S [23] 12:13; 17:12; 19:19; 22:24; 22:25; 23:1; 25:25; 30:7; 30:25; 32:6; 32:16; 32:22; 33:15; 34:15; 39:22; 66:17; 66:23; 70:5; 70:16; 72:23; 73:8; 73:11; 77:6;
THICKNESS [2] 49:19; 61:6;
THING [10] 5:21; 14:2; 18:3; 26:8; 30:3; 66:20; 92:21; 92:22; 93:1; 95:18;
THINGS [36] 4:17; 4:23; 5:11; 7:5; 7:16; 8:19; 8:20; 9:9; 10:6; 17:18; 19:15; 21:3; 21:4; 21:5; 21:19; 21:21; 21:22; 25:21; 34:3; 34:7; 34:17; 37:14; 40:18; 40:24; 44:23; 66:23; 68:22; 72:22; 74:15; 77:7; 80:25; 82:12; 87:24; 90:5; 90:21; 97:7;
THINKING [4] 25:17; 29:1; 79:23; 92:4;
THIRD [1] 52:6;
THOROUGHLY [2] 10:7; 57:20;
THOUGH [3] 74:18; 96:12; 98:13;
THOUGHT [2] 30:1; 53:20;
THOUSANDS [1] 38:5;
THREE [12] 8:14; 26:1; 26:10; 51:6; 56:13; 56:22; 58:9; 63:9; 63:12; 70:6; 70:7; 79:23;
THREE-DIMENSIONAL [3] 21:2; 57:21; 62:1;
THROUGH [29] 5:21; 6:16; 8:23; 9:12; 11:5; 16:7; 19:21; 21:7; 24:14; 24:21; 27:12; 30:5; 32:4; 32:8; 32:25; 39:17; 55:13; 64:3; 72:15; 75:7; 79:14; 79:22; 79:23; 80:22; 88:4; 95:4; 97:20; 97:21; 98:3;
THROUGHOUT [2] 26:11; 34:6;
THROWING [2] 93:3; 93:12;
THURSDAY [4] 93:18; 94:14; 94:15; 94:20;
THUS [1] 33:15;
TIGHT [1] 6:10;
TIGHTER [1] 18:22;
TILTED [1] 21:10;
TIME [50] 6:22; 7:23; 8:17; 12:10; 12:13; 15:14; 15:25; 24:12; 24:15; 24:17; 25:2; 25:16; 26:23; 26:24; 27:13; 29:6; 32:15; 36:24; 37:1; 37:23; 37:24; 39:24; 41:16; 44:2; 44:6; 44:12; 44:15; 44:23; 55:10; 55:13; 57:8; 57:12; 57:12; 69:11; 70:3; 71:3; 81:24; 83:7; 83:20; 83:24; 84:22; 85:7; 87:19; 88:21; 89:1; 91:6; 92:10; 93:4; 93:24; 96:14;
TIME-DEPENDENT [1] 40:18;
TIMES [4] 27:11; 38:10; 84:19; 87:6;
TIMING [2] 57:10; 57:14;
TODAY [6] 43:12; 45:2; 71:17; 71:23; 80:19; 88:23;
TOGETHER [8] 14:20; 48:8; 50:3; 70:25; 72:19; 75:15; 78:5; 79:1;
TOOK [1] 8:15;
TOOL [4] 17:21; 25:20; 37:21; 39:20;
TOOLS [2] 17:17; 27:18;
TOP [4] 12:21; 17:23; 21:4; 63:24;
TOPOGRAPHIC [2] 19:16; 32:20;
TOPOGRAPHY [1] 21:18;
TOWARDS [8] 18:25; 21:13; 38:12; 44:5; 44:8; 44:15; 44:16; 73:22;
TRACK [2] 11:21; 41:4;
TRACKING [8] 22:12; 23:6; 23:17; 23:18; 23:19; 24:2; 24:6; 26:1;
TRADE-OFFS [1] 6:6;
TRAINS [1] 48:8;
TRANSCRIPTS [1] 17:10;
TRANSIENT [2] 23:8; 38:11;
TRANSMISSIVITIES [2] 13:16; 61:11;
TRANSMISSIVITY [3] 58:8; 61:6; 63:5;
TRANSPORT [8] 8:9; 9:2; 20:24; 22:11; 23:7; 26:22; 37:10; 45:23;
TRANSPORTATION [1] 20:10;
TREATED [1] 71:18;
TREATING [1] 93:8;
TREATMENT [7] 25:22; 46:1; 48:7; 48:8; 48:9; 75:25; 82:12;
TREND [3] 46:15; 46:20; 46:22;
TRIED [2] 45:12; 60:15;
TRIGGER [1] 78:15;
TRUE [1] 91:12;
TRY [9] 15:17; 23:12; 23:19; 74:19; 76:17; 77:3; 91:3; 93:5; 93:9;
TRYING [15] 14:24; 15:12; 59:20; 60:17; 70:20; 73:16; 74:13; 75:7; 76:19; 81:24; 84:13; 91:2; 95:3; 95:7; 98:17;
TUESDAY [6] 80:18; 81:14; 82:5; 82:7; 84:9; 94:14;
TUNE [2] 37:7; 90:19;
TURN [5] 26:5; 27:8; 53:12; 57:7; 71:12;
TURNED [5] 53:8; 54:17; 57:2; 57:11; 57:11;
TWEAK [1] 90:18;
TWO [15] 26:14; 48:21; 52:23; 54:13; 56:23; 63:25; 64:25; 72:7; 75:23; 76:11; 77:9; 77:14; 84:8; 85:17; 97:23;
TWO-DIMENSIONAL [1] 15:10;
TYPE [15] 4:10; 5:21; 6:13; 7:6; 12:6; 18:3; 26:8; 39:13; 41:19; 50:2; 52:11; 63:1; 74:10; 74:17; 82:20;
TYPES [9] 4:23; 8:3; 26:18; 27:6; 27:13; 38:9; 40:20; 40:23; 87:7;
TYPICAL [1] 34:14;
============
- U -
============
U.S [2] 42:10; 74:8;
ULTIMATELY [3] 20:23; 28:21; 47:20;
UNABLE [1] 10:19;
UNCERTAINTY [1] 39:4;
UNDER [2] 23:24; 24:9;
UNDERLYING [1] 19:17;
UNDERNEATH [3] 18:21; 31:2;

UNDERSTAND [2] 17:10; 17:12;
UNDERSTOOD [1] 36:20;
UNFAIR [1] 40:14;
UNFORTUNATELY [1] 71:23;
UNINTELLIGIBLE [8] 4:5; 4:24; 9:18; 10:20; 26:22; 41:17; 83:17; 91:6;
UNIQUE [1] 52:8;
UNIT [6] 4:21; 13:18; 49:23; 51:15; 70:4; 79:25;
UNITED [1] 9:24;
UNITS [2] 13:16; 20:4;
UNSATURATED [7] 12:1; 14:4; 14:6; 14:8; 14:25; 15:21; 32:19;
UNSEWERED [2] 33:12; 34:13;
UNTIL [5] 9:20; 16:19; 77:20; 79:24; 79:24;
UP [48] 5:22; 7:22; 9:20; 10:6; 12:19; 15:14; 18:8; 18:13; 20:18; 21:23; 23:1; 24:8; 24:10; 24:17; 24:24; 25:2; 25:9; 25:16; 31:16; 31:17; 31:20; 32:14; 33:5; 33:18; 35:15; 36:10; 38:22; 43:14; 45:13; 52:13; 52:25; 53:5; 53:20; 53:24; 55:25; 58:5; 62:17; 62:19; 71:11; 71:15; 73:22; 74:25; 79:10; 84:7; 90:24; 98:14; 99:3; 99:7;
UPCOMING [1] 43:10;
UPDATE [7] 46:22; 77:4; 80:23; 81:15; 81:22; 83:4; 83:12;
UPDATING [2] 46:14; 96:13;
UPGRADIENT [5] 20:17; 24:7; 30:7; 56:25; 68:16;
UPHILL [1] 17:1;
USA [1] 3:12;
USE [18] 9:22; 17:9; 34:7; 34:15; 37:9; 51:7; 51:24; 58:5; 65:14; 67:13; 72:10; 73:11; 73:15; 75:1; 76:12; 84:23; 91:4; 91:14;
USED [14] 4:20; 10:8; 10:11; 22:11; 29:25; 34:9; 38:5; 45:19; 46:21; 48:4; 50:16; 52:21; 58:13; 87:10;
USEFUL [1] 49:13;
USES [1] 10:10;
USING [20] 10:2; 10:5; 14:9; 17:17; 37:1; 52:9; 57:24; 58:4; 58:11; 60:23; 65:11; 65:13; 69:14; 72:15; 74:2; 74:5; 74:7; 74:9; 75:1; 92:24;

=============
- V -
=============

VACUUM [2] 70:21; 95:10;
VADOSE [6] 11:19; 12:1; 14:3; 14:13; 16:7; 16:10;
VALLEY [1] 20:19;
VALUABLE [1] 69:2;
VALUE [4] 8:12; 49:24; 69:2; 69:20;
VALUES [14] 40:19; 40:25; 41:3; 58:8; 61:5; 61:7; 62:7; 62:8; 62:22; 62:23; 63:3; 64:5; 87:9; 87:11;
VAPOR [5] 70:17; 71:1; 71:10; 79:4; 79:6;
VARIANCES [2] 98:22; 98:24;
VARIOUS [3] 27:4; 31:23; 60:19;
VAST [1] 12:8;
VENDORS [1] 50:2;
VENTURA [3] 54:5; 56:14; 64:21;
VERDUGO [1] 30:8;
VERSUS [5] 5:12; 34:11; 55:10; 55:22; 92:3;
VERTICAL [5] 50:24; 55:12; 56:2; 58:10; 63:6;
VERTICALLY [1] 26:11;
VIA [1] 3:10;
VIEW [3] 17:11; 21:2; 27:7;
VISIT [1] 29:16;
VISUALIZE [2] 17:22; 20:5;
VOC [1] 79:6;
VOCS [3] 46:2; 48:9; 70:14;
VOIDS [1] 99:9;
VOLUMES [2] 15:16; 34:6;

=============
- W -
=============

WAITED [1] 87:15;
WAITING [1] 72:17;
WALKED [1] 76:5;
WANTED [10] 17:7; 24:12; 29:21; 43:4; 43:10; 58:1; 68:7; 68:24; 77:18; 78:10;
WASHES [1] 31:24;
WASTE [1] 22:7;
WATCHING [1] 24:7;
WATER [82] 4:6; 4:7; 4:8; 4:11; 4:17; 4:19; 11:18; 11:20; 12:2; 12:4; 12:11; 12:15; 12:16; 12:17; 12:21; 13:1; 13:17; 13:23; 13:23; 13:25; 13:25; 14:10; 14:13; 15:19; 16:7; 16:7; 19:5; 19:5; 19:20; 23:23; 23:25; 24:9; 25:3; 30:14; 31:19; 31:19; 32:1; 32:3; 32:6; 32:7; 32:13; 32:14; 32:16; 32:21; 32:23; 33:5; 33:6; 33:18; 33:18; 33:21; 33:23; 33:24; 33:25; 34:1; 34:4; 34:15; 34:23; 35:6; 36:11; 36:18; 36:18; 36:20; 37:2; 38:15; 38:20; 40:19; 49:8; 49:11; 50:16; 53:10; 62:24; 68:19; 69:12; 71:18; 71:21; 76:16; 95:20; 96:1; 96:2; 96:7; 96:23; 97:14;
WATERMASTER [1] 34:24;
WATERS [1] 33:10;
WAY [17] 21:24; 22:16; 28:13; 30:5; 32:21; 32:22; 37:4; 37:16; 55:9; 60:20; 61:24; 62:17; 63:21; 80:5; 88:14; 93:10; 95:8;
WAYS [5] 37:18; 91:12; 93:6; 96:18; 96:20;
WEDNESDAY [3] 82:5; 82:6; 82:10;
WEEK [3] 77:16; 93:16; 94:5;
WEEKLY [4] 85:16; 85:21; 85:24; 86:1;
WEEKS [2] 72:20; 77:14;
WELL'S [1] 24:22;
WELL-DEVELOPED [1] 6:23;
WELLHEAD [2] 59:2; 59:3;
WELLS [117] 4:5; 4:14; 5:10; 6:3; 6:9; 6:10; 6:11; 6:15; 19:25; 20:14; 20:16; 20:18; 20:19; 20:20; 22:6; 22:8; 23:15; 23:21; 25:1; 30:22; 39:17; 48:2; 48:22; 48:23; 49:2; 49:3; 49:17; 49:18; 51:8; 51:8; 51:14; 51:19; 51:22; 51:24; 51:25; 52:4; 52:15; 52:16; 52:19; 52:21; 52:25; 53:7; 53:13; 53:16; 53:17; 53:19; 53:19; 53:20; 53:21; 53:22; 54:2; 54:4; 54:6; 54:7; 54:8; 54:10; 54:11; 54:12; 54:18; 54:22; 56:4; 56:12; 56:13; 56:15; 56:15; 56:16; 56:19; 56:20; 56:24; 57:5; 57:6; 57:6; 57:8; 57:13; 58:13; 58:18; 58:24; 58:25; 59:10; 59:12; 59:18; 60:7; 60:8; 61:15; 62:4; 62:21; 62:25; 63:11; 64:2; 64:6; 64:22; 64:25; 65:7; 65:8; 65:22; 65:23; 66:2; 66:3; 66:21; 67:22; 67:25; 68:6; 68:8; 69:1; 69:6; 69:10; 69:11; 69:14; 69:15; 70:18; 70:23; 71:10; 71:13; 76:12; 76:12; 90:13; 95:21;
WENT [15] 9:9; 76:5; 76:5; 76:7; 76:9; 77:16; 77:16; 77:18; 77:21; 80:18; 80:22; 81:13; 81:13; 82:18; 83:20;
WEST [1] 21:14;
WHATEVER [4] 13:8; 43:3; 83:23; 85:22;
WHATNOT [2] 60:14; 67:8;
WHEELER [1] 87:10;
WHETHER [12] 4:16; 23:12; 29:3; 29:4; 46:8; 46:11; 46:18; 59:10; 71:11; 77:14; 87:16; 97:16;
WHILE [5] 10:3; 42:3; 51:16; 70:19; 72:17;
WHOLE [12] 5:15; 15:20; 17:11; 33:3; 41:24; 60:5; 67:6; 76:3; 80:2; 93:2; 96:10; 96:16;
WIDESPREAD [1] 9:21;
WILDLY [1] 36:11;
WILL [21] 8:1; 12:2; 14:17; 18:6; 28:4; 36:4; 43:17; 49:7; 60:8; 70:8; 71:9; 75:1; 75:1; 75:24; 76:22; 85:8; 85:13; 88:25; 89:1; 89:12; 94:2;
WINDSOR [3] 54:5; 56:14; 64:21;
WITHOUT [3] 5:15; 6:4; 35:20;
WON'T [3] 11:12; 85:6; 85:7;
WONDERING [1] 64:9;
WOODWARD [5] 3:14; 42:11; 42:11; 85:24; 86:11;
WORD [1] 84:21;
WORDS [2] 50:23; 58:13;
WORK [23] 29:13; 30:25; 36:5; 43:6; 43:7; 44:22; 45:3; 45:10; 46:13; 47:2; 47:3; 47:15; 47:18; 51:3; 73:7; 73:13; 74:20; 82:8; 82:9; 95:20; 96:1; 98:17; 98:25;
WORKED [2] 73:9; 91:10;
WORKING [20] 7:24; 43:16; 44:20; 44:24; 57:7; 70:3; 75:11; 75:12; 79:8; 80:15; 80:24; 80:25; 81:1; 81:1; 81:16; 82:13; 83:10; 85:15; 87:18; 95:9;
WORKPLAN [7] 8:11; 44:4; 45:17; 71:1; 87:15; 87:17; 87:24;
WORKS [1] 61:24;
WORLD [4] 62:12; 63:16; 65:4; 65:25;
WORRIED [2] 12:24; 35:21;
WORRYING [1] 35:20;
WROTE [1] 9:16;

=============
- X -
=============

X [1] 55:11;

=============
- Y -
=============

YEAR [9] 44:8; 44:12; 44:13; 53:3; 69:9; 81:9; 85:17; 86:10; 97:9;
YEARS [8] 23:9; 27:8; 35:20; 36:9; 37:15; 38:2; 38:4; 38:5;
YELLOW [4] 18:5; 18:5; 18:18; 31:13;
YOUNGER [1] 10:1;
YOURS [1] 67:19;
YUCCA [1] 38:7;

=============
- Z -
=============

ZONE [14] 11:19; 12:1; 13:6; 14:3; 14:13; 16:8; 16:10; 19:9; 23:23; 27:9; 49:6; 49:12; 51:12; 78:15;
ZONES [4] 13:24; 49:9; 49:16; 49:20;
ZUROMSKI [98] 3:15; 9:13; 10:18; 10:21; 10:23; 10:25; 11:4; 11:8; 11:11; 11:14; 18:9; 19:11; 27:22; 28:2; 29:3; 30:18; 31:13; 41:23; 42:2; 42:6; 42:14; 42:14; 42:17; 42:21; 43:1; 43:4; 58:15; 58:21; 59:3; 60:3; 60:10; 61:18; 64:7; 64:10; 64:14; 64:17; 66:17; 68:11; 68:18; 68:22; 69:24; 70:2; 74:4; 75:23; 78:19; 79:5; 79:17; 80:11; 81:7; 81:9; 81:21; 82:4; 83:3; 84:25; 85:3; 85:5; 85:7; 85:20; 86:2; 86:8; 86:13; 86:17; 86:19; 86:22; 87:8; 88:2; 88:5; 88:8; 89:3; 89:7; 89:11; 89:17; 89:21; 90:20; 92:8; 92:21; 93:15; 93:19; 93:23; 94:2; 94:5; 94:7; 94:10; 94:12; 94:15; 94:18; 94:23; 94:25; 95:11; 95:17; 95:23; 95:25; 96:24; 97:2; 97:5; 98:21; 99:13; 99:15;