



Our Water Research Laboratory (WRL)

! "#\$%&'#() *+##*\$&'*,#- *+*&, .%#/#&0),&'),1#()2!

#\$%&'!()*(+!,-*!. (/012'!0*31&)4!. 3,*!/*' *3/5-!036(/3,(/&'7!89/!',3++!3/*!/*5(4)&' *1!
,:;/,'!3,!311/*' '&)4!. 3,*!/*!/(60* <'!35/('!=3/&(9'!. 3,*!/*)4&)**/&)4!1&'5&;0&)*'!3)1!
)=&/(<*)',7!>0()4' &1*!(9/!3531* <85!/*' *3/5-*!'?! *!-3=*!3!,*3<!(+!;/(+*' '&)30!
)4&)**/'!. -(!'(0=*!;/ (60* <'!+(/!&)19' ,/@!3)1!4(=*/)<*) ,!&!)3!/3)4*!(+!1&+*/),!. 3@'!
,-(94-!3; ;0&*1!/*' *3/5-7!#*!-3=*!; -@' &530!036(/3,(/&'! . -*/!*' *!53)!,*' ,!*)4&)**/&)4!
1*' &4)'!3)1!&<903,*!/*30A. (/01!;/ (60* <' B!. *!-3=*!1*' C, (;!3)1!5(<; 9,*!/63' *1!
'(09,&())'!. *2=*!1* *=0(; *1!&)A-(9' *B!3)1!. *!30' (!-3=*!3!. &1*!=3/&*,@!(+!*D9&; <*) ,!. *!
53)!9' *!,(!,3C*!<*3' 9/* <*) ,!&!)!,-*!+&*017!

E

! "#3)4#5&61#76(8+' ,1#),#9): * ,65 *6'#; &,'6* ,+##%&: *#1)8#.)<&0),&'*(#47'%#&'#%'*#
=*6',*2!

8=*/!,-*!@*3/'!,-*/*!. (901!6*!-9)1/*1' E!#*!-3=*!. (/C*1!&)!3!-94*!/3)4*!(+!3/*3'!+/(<!
4&=&)4!; (0&5@!31=&5*!3)1!*: ;*/,!/*=&* . !,(!4(=*/)<*) ,?! ,(!. (/C&)4!. &,-!*'4&)**/&)4!
5(<; 3)&'!3)1!5(),/35,('!)!03/4*!;/ (F*5,'7!G@; *'!(+!;/ (F*5,'!/3)4*!+/(<!;/ (=1&)4!
,:;/ ,! &,) *' '!3,!-*/!/*5*) ,!H/3),-3<! !0((!J(<<&' '&!)!(+!K)D9&/@!&),(!,-*!LM''"
N9**)'03)1!+0((1'?! ,(!. * ,03)1!/*' ,(/3,&())? !6*35-!*/(' &!)!;/ (,*5,&())?!&<; / (=1&)4!,-*!
1*' &4)!(+!' ,(/<! 3,*!/*' @' ,* <'?! ,(!3' ' *' '&)4!4/(9)1. 3,*!/*' '9*'!3/(9)1!5(30!' *3<!
43'!3)1!5(30!<&)*!1* *=0(; <*) ,!7!

! "#3)4#()#1)8#.)66* . '#47'%#1)8,#9): * ,65 *6'#&6(#76(8+' ,1#; &,'6* ,+2!

#*!4* ,!(9,!(+!,-*!036(/3,(/@E!89/!',3++!3/*!5(),&)9(9' 0@!5&/5903,&)4!. &,-!&)19' ,/@!
;/(+*' '&)30'!3,!*=*) ,!3)1!5()+/*')5*'7!>)1!. *!-3=*!3!5() '&1*/360*!) * ,. (/C!(+!
&)19' ,/@!5(),35,'! , -3,! *2=*! '955*' '+900@!5(0036(/3,*1!. &,-!(=*/!,-*!@*3/'! . -(!3/*!
-3; ;@!,(!/*5(<<*)1!9'!,(!(-*/*'7!#*!-3=*!3!0(!,+!&)19' ,/@!5())*5,&())'!. -(!3/*!
OPQ#!309<)&!)1! (IC) (!(+!# \$%!,-(94-!,-*&!&<*!' ,91@&)4!3,!0)&=*/' &,@!7!89/!
/*' *3/5-*!'!3/*!35,&=*!(!&)19' ,/@!3)1!4(=*/)<*) ,!; 3)*0'!3)1!6(3/1'?!3)1!. *2/*!30' (!
=*/@!35,&=*!&!)!;/ (=1&)4!5(),&)9&)4!*1953,&())! ,(!;/35,&,&())*/'! ,-(94-!,/3&)&)4!5(9/' *'7!

! "#3)4#()#1)8,#, ,)>*. '+#9*6*,&<<1#,)<<#)8'2!

8+,*)!. *!3/*!3; ;/(35-*1!1&/*5,0@!, (!' (0=*!3!' ; *5&+&5!; /(60* <7!# *!/*' *3/5-!, - *!; /(60* <?!
5(<*!9; !. &, -!3!< * , - (1!3) 1!3!' (09,&()?!3) 1!, - *)!3; ; 0@!&,!&)!3!; /35,&530!. 3@7!# *2/*!
;/(6360@!()) *!(+!, - *!+*. !4/(9; ' !&)!>9' ,/30&3!, -3,!35,9300@!-3=*!6(, -!, - *!/*' *3/5-!
C) (. 0*14*!3) 1!, - *!; /35,&530!36&@!, (!3; ; 0@!&,7!8+, *)?!. *200!6 *!&)=(0=*!1!, -/(94-(9,!, - *!
. -(0*!0&+*5@50*!(+!3!; /(F*5,7!I (/!*: 3<; 0*!. *!. */*!- *3=&@!&)=(0=*!1!. &, -!, - *!1* ' &4)!(+!
Q@1) *@2' !1*' 30&) 3,&()!; 03),7!# *!69&0,!' 530*!<(1*0' !(+' ; *5&+&5!; 3/, '!(+!, - *!; 03),!, (!

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